THE ROLE OF INFORMATION TECHNOLOGY IN EMERGENCY MANAGEMENT

HEARINGS

BEFORE THE

SUBCOMMITTEE ON
INVESTIGATIONS AND OVERSIGHT

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

FIRST SESSION

NOVEMBER 16, 17, 1983

[No. 63]

Printed for the use of the
Committee on Science and Technology

U.S. GOVERNMENT PRINTING OFFICE
29-457 O WASHINGTON : 1984

H701-37

COMMITTEE ON SCIENCE AND TECHNOLOGY

DON FUQUA, Florida, *Chairman*

ROBERT A. ROE, New Jersey
GEORGE E. BROWN, JR., California
JAMES H. SCHEUER, New York
RICHARD L. OTTINGER, New York
TOM HARKIN, Iowa
MARILYN LLOYD, Tennessee
DOUG WALGREN, Pennsylvania
DAN GLICKMAN, Kansas
ALBERT GORE, JR., Tennessee
ROBERT A. YOUNG, Missouri
HAROLD L. VOLKMER, Missouri
BILL NELSON, Florida
STAN LUNDINE, New York
RALPH M. HALL, Texas
DAVE McCURDY, Oklahoma
MERVYN M. DYMALLY, California
PAUL SIMON, Illinois
NORMAN Y. MINETA, California
RICHARD J. DURBIN, Illinois
MICHAEL A. ANDREWS, Texas
BUDDY MacKAY, Florida
TIM VALENTINE, North Carolina
HARRY M. REID, Nevada
ROBERT G. TORRICELLI, New Jersey
FREDERICK C. BOUCHER, Virginia
LARRY WINN, JR., Kansas
MANUEL LUJAN, JR., New Mexico
ROBERT S. WALKER, Pennsylvania
WILLIAM CARNEY, New York
F. JAMES SENSENBRENNER, JR., Wisconsin
JUDD GREGG, New Hampshire
RAYMOND J. McGRATH, New York
JOE SKEEN, New Mexico
CLAUDINE SCHNEIDER, Rhode Island
BILL LOWERY, California
ROD CHANDLER, Washington
HERBERT H. BATEMAN, Virginia
SHERWOOD L. BOEHLERT, New York
ALFRED A. (AL) McCANDLESS, California
TOM LEWIS, Florida

J. H. POORE, *Executive Director*
ROBERT C. KETCHAM, *General Counsel*
REGINA A. DAVIS, *Administrator*
DAVID S. JEFFERY, *Minority Staff Director*

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

ALBERT GORE, JR., Tennessee, *Chairman*

HARRY M. REID, Nevada
HAROLD L. VOLKMER, Missouri
ROBERT A. ROE, New Jersey
RICHARD J. DURBIN, Illinois
JAMES H. SCHEUER, New York
JOE SKEEN, New Mexico
ALFRED A. (AL) McCANDLESS, California
CLAUDINE SCHNEIDER, Rhode Island

ROBERT B. NICHOLAS, *Chief Counsel/Staff Director*
STEPHEN A. OWENS, *Counsel*
JAMES E. JENSEN, *Investigator*
ROBERT W. LAMINA, *Minority Technical Consultant*

CONTENTS

WITNESSES

	Page
November 16, 1983:	
Thomas G. Belden, Rockville, Md	3
William E. Williams, Director, Emergency Operations, Federal Emergency Management Agency, accompanied by Bruce Campbell, Assistant Director for Information Resources Management; Ashley Holmes, Manager of Emergency Information and Coordinating Center; and Joseph Mealy, Division Chief, Emergency Management Systems, State and Local Programs and Support	12
Robert F. Littlejohn, deputy director, Office of Civil Preparedness, New York; Dino Brugioni, Falls Church, Va.; Jerome E. Dobson, Tempe, Ariz.; and Robert Wilkerson, director, Division of Public Safety, Planning and Assistance, Tallahassee, Fla	40
November 17, 1983:	
James W. Morentz, Jr., president, Research Alternatives, Inc., accompanied by Charles Wittenberg, president, Wehrman Consultants Associated, Inc	110
David Y. McManis, National Intelligence Officer for Warning, Central Intelligence Agency, accompanied by Jacques F. Vallee, consultant	118
Curtis L. Fritz, Dids Co., accompanied by Ashley Holmes, Manager, Emergency Information and Coordination Center, Federal Emergency Management Agency	130
Vincent J. Heyman, senior associate, Policy Sciences Division, Planning Research Corp., accompanied by Timothy Campbell, director, Emergency Services for Chester County, Pa	139
Lt. Col. Duane A. Adams, Arlington, Va., accompanied by George H. Hicken, Project Manager, Coins, National Security Agency, Fort Meade, Md	146
Dr. Joseph F. Coates, J. F. Coastes, Inc., Washington, D.C., accompanied by Roy Popkin, deputy director, Disaster Services, National Headquarters, Red Cross of America, Washington, D.C	152
Robert L. Chartrand, senior specialist in information policy and technology, Congressional Research Service	155
Appendix: Changes in oral testimony submitted by Mr. Dino Brugioni	157

THE ROLE OF INFORMATION TECHNOLOGY IN EMERGENCY MANAGEMENT

WEDNESDAY, NOVEMBER 16, 1983

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
Washington, D.C.

The subcommittee met, pursuant to notice, at 9:30 a.m., in room 2325, Rayburn House Office Building, Hon. Albert Gore, Jr. (chairman of the subcommittee) presiding.

Mr. GORE. The subcommittee will come to order.

I would like to welcome this distinguished gathering, our witnesses and our guests and those who are going to take part in the discussions throughout the day and tomorrow. We are really pleased to have you here and I hope that you enjoy this event. I hope that it will be as valuable for the country as we expect it to be.

In any event, let me begin with an opening statement and then we'll go right on to our distinguished panel of witnesses.

In recent months, we have witnessed a succession of emergencies across the country, such as floods in Nevada and Arizona, hurricanes along the gulf coast and earthquakes in the West. Tragically, as these events illustrate, disasters are not merely figments of a movie producer's imagination, but are instead very real and catastrophic.

The ability of the Government to anticipate and to respond to such crises may well make the difference between a tragedy averted and major loss of life.

Whether at home or abroad, disasters always seem to immediately bring a surge of critical hindsight analysis of how well responsible authorities functioned. Were the existing warning systems adequate? Should we have been able to predict such emergencies? Once alerted, did we react as quickly as we should have? Is the current technology sufficient, and if not, what do we need for the future?

Well, during the next 2 days, we will examine these questions, as well as look for other ways in which information technology can be utilized more effectively during emergencies.

In addition to our distinguished panel of witnesses this morning, the subcommittee has invited over 100 emergency management specialists from across the country to participate in a series of workshops. They will meet following this morning's hearing and

present their findings and recommendations to the subcommittee at our session tomorrow afternoon.

And I might say that we're quite excited about the format for this 2-day event. Often we've had the experience on this subcommittee of bringing together a lot of expertise into the same room at the same time and focusing intensely on a particular subject. We've found that as often as not, the people from different parts of the country with unique insights, while they are not meeting each other for the first time, they're confronting each other with their latest findings for the first time. And by the time the hearing is over with, some of those who have come as witnesses have actually changed their minds about what they testified to begin with.

So this time, we are doing it a little bit differently. Those experts from around the country—and we feel we have the most distinguished group possible for this exercise—are going to meet with each other after the witnesses testify today and hopefully some cross-fertilization, to use that word, will take place with some distillation of ideas and insights. And then we will have the benefit of those insights and conclusions tomorrow.

So we are really excited about that and we don't think it is unreasonable to hope that this might be a model for other such congressional hearings in the future.

In any event, we're very, very pleased and gratified with the overwhelming response from such a distinguished group around the country, and we are thankful that you are willing to put this much time and effort into an exercise that has obvious implications for the public interest.

We have asked the six workshop leaders to focus on the following areas: the cooperative use of information technology by governmental agencies and the private sector; the value of simulating emergency situations; establishment and utilization of analyst work stations; the current effectiveness of emergency operation centers; contingency capabilities; and other public policy issues.

We are all aware of the tremendous technological advances made in the last few years. We have seen and benefited from their applications in the areas of health and medicine, environment, and other scientific fields. But we must also insure that this technology is applied to our Nation's ability to predict, prevent, and respond quickly and effectively to natural or manmade disasters.

To our witnesses, let me say that we welcome your efforts in this area and look forward to your testimony. To the participants in the workshops, again, we are extremely grateful.

I'd like to call on the ranking minority member of our subcommittee, Congressman Joe Skeen.

Mr. SKEEN. Thank you very much, Mr. Chairman. I don't have any extensive opening remarks this morning except to tell you that I commend you for the hearings, look forward to the testimony with great interest and I think we ought to get on with it.

Mr. GORE. Fine; let me say that we have some people standing by the doorway. You're welcome to fill in some of these chairs in the front row if you care to, and feel free to do so if you want. There may be a couple of—no, I don't see any——

Mr. SKEEN. Great opportunity, some of you may even want to run for Congress. [Laughter.]

Mr. GORE. We're glad to welcome C-Span in covering these hearings. It's appropriate, since the hearing involves new information and technology. They're making a tremendous public contribution.

Well, let me call our first witness to the witness table, Dr. Thomas G. Belden, from Rockville, Md. Dr. Belden, if you would come up and join us in front of that microphone there.

Dr. Belden participated in the hearings that we had earlier on this topic and did so well we invited him for an encore. We're delighted to have your latest insights and conclusions, Dr. Belden, and if you could start us off, without objection, we'll put your entire prepared statement into the record at this point and you please proceed in any fashion you see most fit.

STATEMENT OF THOMAS G. BELDEN, ROCKVILLE, MD.

Mr. BELDEN. Thank you, Mr. Chairman, and members of the committee.

I certainly feel privileged to be asked back here.

Mr. GORE. Is that microphone on?

Mr. BELDEN. It's been 2 years—can you—can you hear it all right?

Mr. GORE. That's a little better, yeah.

Mr. BELDEN. Is that better?

When I appeared before you a little over 2 years ago, I was trying to stress the fact that technology is double edged. It can do wonderful things for you, but it can also create very serious problems in the whole area of command, control, communications and intelligence.

First, you have to determine whether you're building systems that man serves or whether the system is serving man. As I mentioned in the previous testimony, as an example of the double-edged nature of technology, we increase the volume of information with these techniques. The bit rates are going up. There are more and more channels of communication that tend to become filled and I think we lose sight of the fact that all of this information has to terminate in a human being who has a very low bit rate.

The fact that there is so much information, as I mentioned earlier——

Mr. GORE. You said a very low bit rate?

Mr. BELDEN. Yes, sir——

Mr. GORE. OK.

Mr. BELDEN [continuing]. In other words, the human being has an input rate of something like 50 bits a second, which is infinitesimal in comparison to the number of bits that are thrown at him.

Mr. GORE. Large resolution but low bit rate?

Mr. BELDEN. Right. [Laughter.]

And the second thing is that as you increase the volume of information, the ability to pick out that which is relevant goes down. This leads—and I discussed this earlier—to even a kind of reasoning that we all indulge in. You know, there's inductive, deductive and then there's what I call seductive reasoning. [Laughter.]

And that is picking facts to fit the desired conclusion. And as you increase the volume of information, of course, you can find anything to prove your point of view. Now this is a perfectly legitimate

kind of reasoning in adversary proceedings and so on, but the danger is that one begins to think they're being inductive or deductive when they're indulging in it, and this great volume of information that we now have lends itself readily to that.

The other thing is we mentioned the problem of misinformation and disinformation, that is, deliberate misinformation, and how do the systems filter this out and how much is the whole information system poisoned by misinformation and disinformation?

Well, I'm not going to repeat the testimony of last time and I'm going to try to be mercifully short this morning because you have many more speakers that are far more interesting than I am on interesting subjects, but I would like to put up just one vu-graph which is also in the record from last time, if I may.

[Vu-Graph.]

Now, this Vu-Graph is an attempt to look at the problem of information and communications and technology using the human being as a model, rather than some mechanistic system.

In other words, let's say this kind of model is for you in everyday life, when you're driving a car or for instance, I might see somebody smoking and I—up on the lower left-hand side, I sense that. I make an estimate. Do I want to take another chance with cancer? And I say, "Yes." So I get my pipe out and I give myself some commands to take an action—now I'm going down the right side, and say I burn my fingers as I light my pipe. I get a feedback loop that tells me, "You idiot, don't do it that way and store that in your memory," but everybody goes through this cycle in everyday life.

By the way, there are shortcuts in this cycle. For instance, if you put your hand on a red-hot stove, you go from sensing right across to action. That's built in. So there are shortcuts available.

But when the problem gets very large—that is, say a crisis in a large organization, we tend to organize ourselves around this cycle. In the military world, the sensing and estimating is what we know as the intelligence world and there above that, the planning world and you get to the decision and once you take the decision, issuing commands is what the military call a J-3, or operation side, and you go down to take the action and then you look for the impact.

Now, each one of those lines on that chart, each arrow, is some form of information flow, some kind of communication, whether it's face-to-face or large trunks or whatever. Each of these is some communication path and also, it takes time to go through these steps, one to the next. So there is a dynamic to this cycle.

Now, this is a very critical cycle that I think sometimes gets neglected in the design of new weapon systems and that's what I'd like to—the new thing that I'd like to address today in terms of the double-edged aspect of technology.

Because if we develop weapon systems that don't pay attention to this cycle from the beginning, we end up with a system that I'm afraid we become the prisoners of. In other words, we can produce a system and we become a prisoner of the system because we haven't considered how the system fits into our decision cycle as well as our opponent's decision cycle.

Last time, the MX was briefly touched on and I'll use that as an example of the kind of system where we can become the prisoners of it. The MX has gone through many convolutions as to how to

deploy it, the racetrack, the dense pack. Now we're back to square 1 with the Minuteman holes, and when you look at this system from the point of view of the opponent, the minute you pour concrete on a fixed silo or anything, you eliminate the necessity for the opponent to go up the left side of that decision cycle.

In other words, he knows where it is precisely. He doesn't have to bother about going out and sensing where you are; he knows where it is; it's an old artillery problem. You're zeroed in.

This, in turn, makes it very difficult for the defender because it's shortening his time to make a decision. In fact, in the case of the MX, it forces him into a dangerous policy called launch-under-attack [LUA]. This gives our decisionmaker very little discretion as to whether or not to fire. And what kind of information is he getting? Was it a flock of geese? Was it when the Moon went up at NORAD and so on? We know these horror stories.

But by choosing a system without a sufficient attention to the decision cycle, we can endanger ourselves and I'm afraid the worst emergency situation is to have an accidental Armageddon. Thus, the systems we choose have to be designed according to this decision cycle for both ourselves and the opponent.

Now, in the—since I was here last time, the Scowcroft Commission has met. They've come up with the additional recommendation of using a small mobile missile, which I think is certainly a step in the right direction. You, Mr. Chairman, have also subscribed to that position, and I think this is an excellent one.

However, there are some dangers, especially when we're addressing the problem of domestic crises. Because the current proposal is to have these mobile missiles on trucks or railroad cars, I shudder to think, when the first accident occurs, what kind of impact that will have on the general public. Even though there's no nuclear detonation, it would really set back the whole public opinion against such a program.

Now, the other thing that is peculiar about the alternative of the small mobile missile is that the Air Force, I believe, has taken the position that that's fine, but it's going to be a long lead-time item. We have to develop a new missile to do that, and I don't think this is necessarily true.

I'd like to have you think for a moment on a kind of technology where the United States has been rather blind for a great many years. It's a well known technology in Europe and in England and in Russia, and this is the use of surface-effect vehicles. Now, huge surface effects machines are being used to move oil derricks in Canada and dredges in the Congo and so on. Many of you are familiar with surface-effects machines in the hovercraft that carry millions of people and many cars across the Channel.

But for some reason, the United States has been very backward in this particular technology. It turns out that a surface-effects machine would be a most useful way of making a missile mobile because it frees it from the roadbeds and tracks, and second, you can now put it in areas that are remote, away from people.

Now, it turns out that there's 50,000 square miles on the North Slope of Alaska, which is perfectly flat, where surface-effects machines could be used ideally. This is away from the population; it's

also 2,500 miles closer to the Soviet Union, and therefore, you could use a smaller-range missile.

In fact, you could probably use missiles that already exist: namely the Navy's C-4 missile which is already in being. Therefore, the Air Force's contention that they'd have to develop a new missile, I don't think holds water.

Anyway, by using surface-effects machine deployment of missiles, what you're doing is complicating the opponent's decision cycle. You're producing more aim points that he has to consider in a very short time, shorter than he can manage, and that is the essence of deterrence, because you've lowered his decision confidence.

This—I merely go into this as an example of where technology partly can be ignored by not using it, and partly can be ignored by not understanding the decision cycle in terms of both our own decision cycle and the opponent's decision cycle.

So, Mr. Chairman, I'm going to wind up my remarks simply by saying that I am making a plea that we don't develop systems which will allow us to make stupid decisions faster.

Thank you.

Mr. GORE. Well, thank you very much. Do you believe that the existing communications links between Federal, State, and local government elements are capable of coping with the widespread nonnuclear disaster?

Mr. BELDEN. A nonnuclear disaster?

Mr. GORE. Yes.

Mr. BELDEN. I can think, Mr. Chairman, of all kinds of scenarios where they would not be adequate, and worse than that, under certain circumstances, I can think of an intelligence—an intelligent terrorist being able to disrupt the communications that you're speaking of by very simple means, and in fact, use the Bell system long-distance dialing to detonate certain key points that would paralyze the system.

Mr. GORE. I don't want to ask you to go into a lot of detail on that—but presumably some of the people here are also familiar with—with that scenario. And I believe some steps are being taken on that—on that possibility.

Your insights into the decisionmaking cycle are—are very interesting and I think are transferrable. I'm interested—it's a little bit off the point and we have several witnesses, but I know you have some interesting observations on that KAL incident.

How would you analyze that in terms of your decision cycle that you have on the screen?

Mr. BELDEN. I think that the flight 007 Korean shoot-down is a very interesting one to study. I don't know of anybody who is studying it, but I think that one of the things that could be learned in studying that situation is to compare it with the incident with the Korean Airlines in 1978.

Now, in any big command and control system, there's always the controversy whether you have centralized or decentralized command and control. In other words, in a football game, do you send all the plays in from the bench or do you leave the quarterback some initiative?

Now, every nation goes through this argument. Of course, the correct answer is you use both, and the art is to know when to use

which. But I think you'll find that in the 1978 incident, that the Soviet Union had what you would call a highly centralized control and, therefore, the Korean Airliner was in Russian airspace for so many hours before it was forced down.

Now, in the recent incident, we may see just the opposite because it may be that the Soviet Union has changed its doctrine and gone to a decentralized form of control, and that might have been what happened to us—or to that airliner—in the recent shoot-down. I don't know this to be a fact, but the external evidence hints that way.

Now—but other than that, I'd say it will be interesting to study it from that point of view.

Mr. GORE. In your previous testimony, we explored incidents such as Mayaguez and Three Mile Island and others, looking for generic lessons that come from this analytical framework, using your decision cycle architecture. One of the—one of the principal lessons that I felt I learned from your testimony last time was that our ability to deal with critical and useful information during a crisis often depends upon communication between the key analysts, or people in each of several decision cycles or sub-loops that have been set up in advance.

In other words, one of these cycles is set up, not just in theory, but with hardware and software and people are automatically oriented towards others in a specified decision loop. Information that they harvest and process and identify as critical can have enormous value to people in another decisionmaking loop that may be totally unaware of it unless there is a point of contact or a plan to share that critical information between two different decision loops.

You call that internetworking, do you not?

Mr. BELDEN. Yes; I think I referred in my previous testimony, or perhaps in the paper that accompanied it at least, an effort that I engaged in when I was loaned from the Air Force to the intelligence community staff in 1973. My objective there—I had two objectives. One was to do immediate postmortems, and of course, the 1973 war came soon after that and we did that. That's another story, however. I want to get back to the one that you're getting at, I believe here, and that is my other objective was to do exactly what you're saying and that is to allow the intelligence community to communicate across itself, starting with the watch officer level at the 24-hour watch centers. And as a matter of fact, the initial system, which is called the NOIWON, the National Operations and Intelligence Watch Officers' Net, initially only cost $50 to establish and it only took two weeks to make it technically operational, but it took me 10 months to make it really operational because of the cultural differences among the players.

As you know, the CIA people do not necessarily like to talk to J-3 people, et cetera, et cetera, and it took a little trauma of the Mayaguez to get this network really going. I think sometimes the Government doesn't learn except by traumatic experience, if then.

But the——

Mr. GORE. Sometimes we learn too much from traumatic——

Mr. BELDEN. Yes, we can overlearn, right.

Mr. GORE [continuing]. Experiences.

Mr. BELDEN. That's true. But anyway, the NOIWON is now part of the woodwork; you couldn't tear it out if you wanted to. It allows the lateral communication across from the White House, the NMCC of the J-3 and the Pentagon, the DIA, NSA, CIA, the State Department, State INR. All of these people are in a voice—secure voice net, and the minute a critic comes in, or any critical information, it's mandatory to pick up this phone and say the magic word "NOIWON," and the operator at the White House switch presses a button and it rings the phones at the other six places.

Mr. GORE. Yeah.

Mr. BELDEN. Now, this is working and it's fine. Now, the next thing I wanted to do was to do the same thing at the analytical level. So we established a system called NOIAN, National Operations and Intelligence Analyst Net, and we had this working, and we had five rooms around Washington that were beautifully equipped to do this. The system was in existence for 3 years. To my knowledge, it was only used once.

Now, you get so smart so late. I should have known better, but the thing you learn is that information is power and there is a tendency not to share it across the community. That doesn't mean that there aren't analysts who will, who are anxious to, but many won't because it isn't in their best interest.

What they'll do with a powerful piece of information is to take it to their boss—or if they're very smart, they'll wait until their boss goes out to lunch and take it to his boss——

[Laughter.]

Mr. BELDEN [continuing]. But this is the kind of thing that goes on in trying to create lateral networks so the problems are not so much technical as they are cultural.

Mr. GORE. Well, combining the two insights that get through to me as a result of your testimony, No. 1, as you mentioned earlier, the key element in any information system for dealing with a crisis is the individual, and the key elements are the individuals in that system. And the rate of—the bit rate, as you put it, or the rate of information flow has got to be matched to the ability of key decisionmakers to handle it.

Second, recognizing that there are likely to be several sub-loops and the key—information that is critical for one may be processed and identified in another sub-loop.

Then it seems to me that one of the key elements for improving our ability to use information technology in handling crises is to develop a better working relationship or internetwork between the key individuals in the several sub-loops that come into play when a crisis occurs.

Would you agree with that?

Mr. BELDEN. Yes; I certainly would. I think that's a good summary. I'd only add one further observation, and that is, every crisis is different and it requires different kinds of talent to deal with that crisis at the substantive level.

In other words, you can't solve it by just getting the top people, not that they're not smart, but they can't be as knowledgeable as the substantive people where the real talent is.

So this being the case, I think more effort should be put into what I call people retrieval than data retrieval. In other words,

when you're hit with a crisis, find out who is smart about this one and try to net them, either face-to-face or by remote conferencing or whatever. But I think it is very critical in a crisis to do this and it has to be done in a rather ad hoc fashion because, as I say, every crisis is different and every crisis requires different kinds of talent.

So with that slight amendment, I think you've made an excellent summary of the position.

Mr. GORE. Well, very good. Let me—do you want to—should we go over and vote and then come back? All right, fine.

I'm going to call on my colleagues, but we have a vote on the floor and with your indulgence and patience, we'll—we'll recess for about 7 or 8 minutes and then come back and resume.

[Recess.]

The subcommittee will come back to order.

I'd like to call on my colleague, the gentleman from Illinois.

Mr. DURBIN. Thank you.

Dr. Belden, you have, in your life's experience I'm sure, witnessed many such crises and disasters as we've discussed today. Would you like to give us an example of the best-managed crisis that you can recall and the worst, and perhaps a lesson to be learned from each?

Mr. BELDEN. Well, I think, fortunately, the—the best-managed crisis was perhaps our most critical one, the Cuban missile crisis. However, I feel that had it not been for the fiasco, the Bay of Pigs, and the lessons that were learned from that by the administration at the time, that the Cuban missile crisis would not have been handled as well as it was.

In other words, it took that first trauma of a highly mishandled crisis for the President to be able to understand how the Government really works and I think that experience—and I think that when any new administration comes in—I don't care which party—there's always a worry time as to whether they'll have too big a crisis too early in their administration.

It's—as I say, the trauma of learning by experience is the greatest teacher. Did I get to the answer——

Mr. DURBIN. Now would you like to give the worst?

Mr. BELDEN. Well, I think probably one of the worst would be the Bay of Pigs. It was self-inflicted. It had everything wrong: lack of communication, lack of consideration of that decision cycle by enough people. I mean, it was just—it was a crisis, as I say, that there should have been plenty of self-warning because we instituted the action ourselves, so it was probably the worst one.

Mr. DURBIN. Coincidentally, I didn't know what your answer was going to be, but several months ago, I reread a book by Robert Kennedy about the Cuban missile crisis and the decisionmaking process. A couple things I might ask your opinion on. One that I found interesting, there was a decision early on by the administration to involve the Organization of American States in almost every step of the process so that there were no surprises to our allies, which is a somewhat different approach then we've used currently or recently in some other crises.

This idea of bringing in as many of our friends and allies and people with related interest in an early part has to be a tough call

in many national security instances. Do you have any thoughts on that?

Mr. BELDEN. Yes, I certainly think that it is best to—to take action, not unilaterally, if possible. Of course, you can think of situations where that may not be possible because of the matter of time, that you just simply don't have time to do that, or the luxury of doing it.

But I do think if you can do it within the constraints of the necessary security considerations that you're dealing with now, there are some crises where it's very difficult to do that because of the security implications.

Mr. DURBIN. I thought another aspect of it was the fact that in the Cuban missile crisis, it appeared that the decisions were clearly going to be made by the President after all of the evidence had been presented, and although he took advice and many disparate views were presented, he ultimately made that decision and directed the response of the United States to that crisis.

Comparing that to what happened with the Tehran hostage rescue, the aborted attempt, it appears that one of the criticisms there was the fact that the Chief Executive held the right to make decisions right up to the very end. There was a direct communication line to the White House.

Is there any guidance there for us in other crises—or in those two—as to when the Executive has failed to surrender power to a lower-level subordinate that should be surrendered?

Mr. BELDEN. Well, unfortunately, I had left the intelligence community staff—it actually got dissolved—and I went back to the Air Force and that took me out of the arena of the crisis business and so I'm not knowledgeable about the Iranian situation. I mean, I read the papers, so I really don't feel confident to make a judgment on what you brought up. I'm sorry, I just——

Mr. DURBIN. All right. If I could ask one other comment, or make one other comment with a question at the end. It would appear that in most crisis situations—and one thing we'll discuss at length today is the exchange of information—that there is information, and a free flow of it. You mentioned earlier that if the telephone system was brought to a halt—and you felt it could be accomplished very quickly with the right destruction—we would find ourselves in a dilemma, wondering what's going to happen next instead of fully knowledgeable of that situation.

We seem to be facing a similar type of question and challenge as we approach the new theory of satellite weaponry. We are so dependent on satellites today, and now we are talking about crossing that threshold into space and running the risk of destroying our basic communication system, not only from the military, but from a civilian purpose.

Am I correct in my assumption that this information transfer is essential to crisis management of any proportion?

Mr. BELDEN. Yes, I share your concern about the over-dependence on satellite communication. It's so convenient right now and it's of such an enormous band width that you can, you know, have TV if you want. In other words, what I think is perhaps lacking is the principle that a little bit of communication is certainly a lot better than none at all, even if it's by a Morse key. [Laughter.]

Mr. BELDEN. I think that we should have backup systems which allow very critical information to be sent. Now, the mere reduction of the number of messages and the information might even be helpful. You might be able to use this to your advantage.

In other words, having the broadest-band communication at all times, three-color TV and everything else, is not necessarily improving communication, and so in an emergency situation, if we had backup systems that can replace some of the linkages, not with that band width, but narrow band, we'd be much better off.

Mr. DURBIN. Are we moving in that direction? Do you feel——

Mr. BELDEN. I don't know. I'm retired from the Government and I'm—I'm not knowledgeable anymore. I—I do—I have heard a very good rumor. You know, we stopped teaching Morse code in our armed services for quite a while and now I believe they are bringing it back a bit, which is a hopeful sign. [Laughter.]

Mr. DURBIN. Thank you.

Mr. GORE. Well, thank you very much. We're going to be talking a great deal over the next 2 days about new technological developments, and I think it's appropriate and useful to begin with an emphasis on people and a recognition that the individuals in any information system are the keys to making that system operate effectively. New advances in the way key people relate to each other in different information loops are likely to give us greater advances in our ability to handle crises than new advances in the technology per se. The relationship between the people and the technology, and the relationship between the key people and different decision-making loops, probably are more important than new technological developments, but both have some real significance.

Thank you very much for getting us off to a good start, Dr. Belden.

Mr. BELDEN. Thank you, sir.

Mr. GORE. Our next witness is William E. Williams, Director of Emergency Operations with the Federal Emergency Management Agency. Mr. Williams is accompanied by Mr. Bruce Campbell, Assistant Director for Information Resources Management; Mr. Ashley Holmes, Manager of Emergency Information and Coordination Center; and Mr. Joseph Mealy, Division Chief, Emergency Management Systems, State and Local Programs and Support.

I'd like to welcome all four of you to the witness table and to this hearing. Mr. Williams, we're pleased that your could join us at the hearing. Without objection, your entire prepared statement will be included in full in the record and you are invited to proceed—if you wish to summarize any portion of it, or to proceed with the presentation of your statement as you see fit. Welcome.

STATEMENT OF WILLIAM E. WILLIAMS, DIRECTOR, EMERGENCY OPERATIONS, FEDERAL EMERGENCY MANAGEMENT AGENCY, ACCOMPANIED BY BRUCE CAMPBELL, ASSISTANT DIRECTOR FOR INFORMATION RESOURCES MANAGEMENT; ASHLEY HOLMES, MANAGER OF EMERGENCY INFORMATION AND COORDINATING CENTER; AND JOSEPH MEALY, DIVISION CHIEF, EMERGENCY MANAGEMENT SYSTEMS, STATE AND LOCAL PROGRAMS AND SUPPORT

Mr. WILLIAMS. Thank you, sir.

Mr. Chairman, members of the subcommittee, I'd like to summarize a portion of the testimony and then make available to this committee the three witnesses that I have with me that can answer your specific questions in the technology areas.

The central point within the Federal Government for emergency management in peace and war is the Federal Emergency Management Agency. We're taking decisive steps to improve its overall readiness and response posture by initiating a nationwide, integrated emergency management system.

The integrated emergency management system, or IEMS, is based on the recognition that there are common functions that form the foundation for any emergency management program at either the Federal, State or local level.

The improvement of these common capabilities will be given priority, not to the exclusion of other emergency responsibilities, but to their benefit. In emphasizing common elements, we will be enhancing and supporting unique preparedness requirements.

This approach does not reflect a change in FEMA's goals. It does, however, represent a change in our strategy for implementing the agency's goals.

The ultimate goal of emergency management is to save lives and avert property damage. The long-accepted concept of comprehensive emergency management requires the Federal, State and local governments work in cooperation with the private sector to mitigate, prepare for, respond to and recover from all types of emergencies, whether they be natural, man-made or attack-related.

Integrated emergency management is an implementation strategy that advances this concept. It is the process of applying all available resources to accomplish comprehensive emergency management in a manner that is appropriate, effective, efficient and predictable.

IEMS capitalizes on previous efforts by State and local governments to develop and implement a natural implementation concept and strategic plan. With this strategic planning concept as background to support IEMS, we have also been developing an integrated information system, which is named the National Emergency Management System, [NEMS]. NEMS is discussed in considerable detail in an attachment to this testimony.

My further comments here refer to the realities that make the successful implementation of FEMA's NEMS a major agency requirement. In short, NEMS can be considered the nervous system of the FEMA integrated emergency management system, which allows us to support the U.S. emergency management authority, which includes the President, the Vice President, and the Director

of FEMA in their national emergency management authority function.

All the major information systems in FEMA became a part of NEMS. The NEMS concept includes the ideas of ubiquity, compatibility and endurability. Almost as I speak, the technology is changing. Also, with the kind of mission that emergency managers have, the user environment of information systems is changing.

This has been the challenge that we have been facing, and I believe handling quite well. Because technology changes, we have found it more convenient to change our terminology.

When we speak of information systems, we now include within it automatic data processing main frames, minicomputers, microcomputers, word processors, data telecommunications, and nondata telecommunications, which includes radio, telephone systems, voice, and videoteleconferencing and electronic displays. And like the previous witness stated just before me, most importantly, people.

People are just as much a part of the information systems as are the electronic capabilities. I add to this, since the people aspect enters in so strongly, the methods and procedures necessary to interface people with technology.

In the support category, the training of people to use electronic systems is paramount. The words "computer literacy" have entered into people's vocabularies now and the term implies that the lack of being literate about computers is a personal, individual deficiency.

We've been quite busy since we last participated with this committee, busy implementing new technology information systems in the short term, and busy replacing aging and neglected systems—neglected in the sense that capital improvements so necessary to insure our emergency management systems are up to the task.

We have been busy planning and working toward upgrading our existing systems that we may be prepared with the best capabilities possible to respond to the full continuum of emergency situations that may occur.

You'll be hearing about some of these specifics from FEMA experts during this 2-day session.

As a specific example of our efforts in the ADP area, we were two-and-one-half computer generations behind the times within FEMA. I am pleased to report that the agency's major ADP systems will be upgraded at the national headquarters in December of this year, and we will have a first stage of a distributed data processing system in the 10 regions by March.

In FEMA, we cannot accurately predict where the next hazardous events will occur, so our geographic profile is the conterminous United States, Alaska, and the insular possessions.

Whatever we put in place must be a mix of fixed and transportable capabilities and the DDP network must be flexible enough to expand and contract according to the needs.

The dimensions of endurability and reliability are obtained in two ways. No. 1, we have adopted a telecommunications concept of multimedia, using as many different modes of communication service possible; and No. 2, controlled duplications of critical data at multiple locations.

Today, FEMA's information systems contain ADP capabilities that are characteristically dispersed systems rather than fully distributed. We are moving toward the true DDP system in actions we are taking now.

Also, the systems we are putting in place we expect to be transparent to the user's needs and use. This means that word processors we are putting in place will have the capability to communicate and may also be used where full-time demand for word processing is not needed, for applications programing, and for performing data processing functions.

Word processors will be able to communicate with microcomputer and both word processors and microcomputers will be able to communicate with main frames and compatibly interface with all elements of our DDP system.

Our DDP system will be a mix of fixed and transportable systems, using minicomputers as the hubs of the networks and word processors, microcomputers, and various dumb and smart terminals will be integrated into the system.

Significantly, we are targeting off-the-shelf software and commercial-grade equipment that will make it relatively easy for our national system, NEMS, to interface with any State and local capabilities and even those private-sector elements with whom we may need to communicate.

In closing, I would add that this agency is committed to develop information systems to support both our peacetime and wartime responsibilities. We intend to commit all resources necessary to insure that we develop emergency management systems required to help minimize loss of human life and property by the American people.

Thank you, sir.

[The prepared statement of Mr. Williams follows:]

Statement By William F. Williams

Director

Emergency Operations

Federal Emergency Management Agency

Before The

Subcommittee On Investigations And Oversight

Committee On Science And Technology

U.S. House Of Representatives

November 16, 1983

MR CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE:

I AM BILL WILLIAMS, DIRECTOR, EMERGENCY OPERATIONS WITH THE FEDERAL EMERGENCY MANAGEMENT AGENCY.

I APPRECIATE THE OPPORTUNITY TO SPEAK TO YOU TODAY CONCERNING FEMA AND THE VARIOUS ROLES WHICH INFORMATION TECHNOLOGY CAN FULFILL IN EMERGENCY MANAGEMENT SITUATIONS.

AS THE CENTRAL POINT WITHIN THE FEDERAL GOVERNMENT FOR EMERGENCY MANAGEMENT IN BOTH PEACE AND WAR, THE FEDERAL EMERGENCY MANAGEMENT AGENCY IS TAKING DECISIVE STEPS TO IMPROVE ITS OVERALL READINESS AND RESPONSIVE POSTURE BY INITIATING A NATIONWIDE INTEGRATED EMERGENCY MANAGEMENT SYSTEM.

THE INTEGRATED EMERGENCY MANAGEMENT SYSTEM OR IEMS IS BASED ON THE RECOGNITION THAT THERE ARE COMMON FUNCTIONS THAT FORM THE FOUNDATION FOR ANY EMERGENCY MANAGEMENT PROGRAM AT FEDERAL, STATE, OR LOCAL LEVEL. THE IMPROVEMENT OF THESE COMMON CAPABILITIES WILL BE GIVEN PRIORITY, NOT TO THE EXCLUSION OF OTHER EMERGENCY RESPONSIBILITIES, BUT TO THEIR BENEFIT. IN EMPHASIZING COMMON ELEMENTS, WE WILL BE ENHANCING AND SUPPORTING UNIQUE PREPAREDNESS REQUIREMENTS. THIS APPROACH DOES NOT REFLECT A CHANGE IN FEMA'S GOALS. IT DOES, HOWEVER, REPRESENT A CHANGE IN OUR STRATEGY FOR IMPLEMENTING THE AGENCY'S GOALS.

IEMS IS BASED ON GENERIC PLANNING INVOLVING SUCH COMMON ELEMENTS OF EMERGENCY PREPAREDNESS AS EVACUATION, SHELTER, COMMUNICATIONS, DIRECTION AND CONTROL, CONTINUITY OF GOVERNMENT, RESOURCE MANAGEMENT, AND LAW AND ORDER. THESE FUNCTIONS ARE THE BUILDING BLOCKS UPON WHICH THE MANAGEMENT OF A WIDE RANGE OF EMERGENCIES CAN THEN BE BASED. INCREASED CAPABILITY IN EACH AREA RAISES THE OVERALL LEVEL OF LOCAL PREPAREDNESS AND INCREASES ABILITY TO DEAL WITH A HIGHER LEVEL OF EMERGENCY. IEMS PROVIDES A FOCUS ON DEVELOPING AND STRENGTHENING EMERGENCY CAPABILITIES AT THE FEDERAL, STATE, AND LOCAL LEVEL, INCLUDING THE PROVISION OF EQUIPMENT AND TRAINED PERSONNEL NECESSARY TO SUPPORT THE SYSTEM.

THE ULTIMATE GOAL OF EMERGENCY MANAGEMENT IS TO SAVE LIVES AND AVERT PROPERTY DAMAGE. THE LONG-ACCEPTED CONCEPT OF COMPREHENSIVE EMERGENCY MANAGEMENT REQUIRES THE FEDERAL, STATE AND LOCAL GOVERNMENTS WORK IN COOPERATION WITH THE PRIVATE SECTOR TO MITIGATE, PREPARE FOR, RESPOND TO AND RECOVER FROM ALL TYPES OF EMERGENCIES -- NATURAL, MAN-MADE OR ATTACK-RELATED.

INTEGRATED EMERGENCY MANAGEMENT IS AN IMPLEMENTATION STRATEGY THAT ADVANCES THIS CONCEPT. IT IS THE PROCESS OF APPLYING ALL AVAILABLE RESOURCES TO ACCOMPLISH COMPREHENSIVE EMERGENCY MANAGEMENT IN A MANNER THAT IS APPROPRIATE, EFFECTIVE, EFFICIENT, AND PREDICTABLE. IEMS CAPITALIZES ON PREVIOUS EFFORTS BY STATE AND LOCAL GOVERNMENTS TO DEVELOP AND IMPLEMENT A NATURAL IMPLEMENTATION CONCEPT AND STRATEGIC PLAN.

AFTER DIRECT CONSULTATION AND COORDINATION WITH THE STATE GOVERNORS' ASSOCIATION AND MANY OTHER STATE AND LOCAL EMERGENCY MANAGERS, FEMA DEVELOPED IN FY1983, AND IS IN THE FIRST YEAR OF A MULTIYEAR IMPLEMENTATION OF, THE INTEGRATED EMERGENCY MANAGEMENT SYSTEM WHICH IS AN ACTIVE STRUCTURING OF PROGRAMS, PLANS, COORDINATION PROCEDURES AND FIELD GUIDANCE TO PRODUCE A UNIFIED PROCESS THAT APPLIES COMMON MANAGEMENT FUNCTIONS TO VARIED EMERGENCIES WHILE ENSURING THE DEVELOPMENT OF SPECIAL CAPABILITIES FOR SPECIFIC EMERGENCIES, FOR EXAMPLE, A NUCLEAR INCIDENT.

IN INITIATING THE INTEGRATED EMERGENCY MANAGEMENT SYSTEM, FEMA HAS FIVE SPECIFIC GOALS:

1. FUNCTIONAL ALL-HAZARD MANAGEMENT: NATURAL, TECHNOLOGICAL, CRITICAL RESOURCE SHORTAGE, CIVIL DISTURBANCE AND ATTACK;

2. FOUR-SECTOR COOPERATION: FEDERAL, STATE, LOCAL, PRIVATE;

3. FOUR-PHASED MANAGEMENT: MITIGATION, PREPAREDNESS, RESPONSE AND RECOVERY;

4. INTERNAL AND INTERGOVERNMENTAL INTEGRATION AT THE FEDERAL, REGIONAL AND INTERNATIONAL LEVELS AS WELL AS AMONG STATE AND LOCAL JURISDICTION; AND

5. INTEGRATED EMERGENCY MANAGEMENT AS A BASIC INTERACTIVE FUNCTION AT ALL LEVELS OF GOVERNMENT.

THIS CHANGE IN APPROACH WILL RESULT IN A MORE COMPLETE PARTNERSHIP BETWEEN FEDERAL, STATE, AND LOCAL GOVERNMENTS, WITH INCREASED FLEXIBILITY TO STRUCTURE PLANS SUITABLE TO UNIQUE GEOGRAPHICAL OR POPULATION-RELATED NEEDS. THIS WILL STRENGTHEN OUR NATIONAL CAPABILITY TO MANAGE ANY TYPE OF EMERGENCY WHETHER PEACETIME OR WARTIME.

WITH THIS STRATEGIC PLANNING CONCEPT AS BACKGROUND, WE HAVE ALSO BEEN DEVELOPING AN INTEGRATED INFORMATION SYSTEM TO SUPPORT IEMS WHICH IS NAMED THE FEMA NATIONAL EMERGENCY MANAGEMENT SYSTEM (NEMS). NEMS IS DISCUSSED IN CONSIDERABLE DETAIL IN ATTACHMENT HERE.

AS WE SAID IN THE 1981 HEARINGS, THE COMMUNICATION, ADP, AND INFORMATION PROCESSING CAPABILITIES OF THE AGENCIES ARE CENTRAL TO PROGRAM SUCCESS. IN MID-JUNE OF 1981 WE COMMENCED A PRIORITY REVIEW OF WHERE WE STOOD IN THIS AREA. AND ESTABLISHED AN INFORMATION RESOURCE MANAGEMENT TEAM TO: (1) INVENTORY OUR CURRENT REQUIREMENTS AND RESOURCES FOR TELECOMMUNICATION, ADP AND INFORMATION MANAGEMENT; (2) DEVELOPED THE FISCAL YEAR 1983 TELECOMMUNICATIONS AND ADP BUDGET ESTIMATED AND ISSUES FOR THE DIRECTOR; (3) DEVELOPED AN IRM ORGANIZATIONAL STRUCTURE AND MANAGEMENT CONCEPT; AND (4) DEVELOPED THE FEMA INFORMATION MANAGEMENT PLAN REQUIRED BY PUBLIC LAW 96-511, THE PAPERWORK REDUCTION ACT OF 1980, FOR OMB.

THIS PRIORITY REVIEW LED TO THE ESTABLISHMENT OF AN INFORMATION RESOURCES MANAGEMENT OFFICE IN AUGUST 1981. THIS OFFICE PROVIDES POLICY, DIRECTION, GUIDANCE, AND GOALS FOR THE PLANNING, MANAGEMENT, AND BUDGETING FOR INFORMATION RESOURCES IN SUPPORT OF FEMA, TO INCLUDE AREAS SUCH AS OUR EMERGENCY BROADCAST SYSTEM (EBS) OVERSIGHT RESPONSIBILITIES.

THIS OFFICE IS ALSO RESPONSIBLE FOR THE DAY-TO-DAY MANAGEMENT OF THE FEMA ADP AND INFORMATION MANAGEMENT SYSTEMS PLUS OUR EXTENSIVE TELECOMMUNICATIONS AND WARNING SYSTEMS. THIS IS PART OF THE FEMA EMERGENCY OPERATIONS ORGANIZATION. FOR EXAMPLE, IT MANAGES THE FEMA NATIONAL TELETYPE, NATIONAL VOICE, AND NATIONAL RADIO SYSTEMS, THE NATIONAL WARNING SYSTEM, THE WASHINGTON, D.C. WARNING SYSTEM, AND OUR CLASSIFIED SYSTEMS.

THE ESTABLISHMENT OF A CENTRALIZED INFORMATION RESOURCES MANAGEMENT OFFICE PROMOTES MULTIPLE USE OF INFORMATION RESOURCES, STANDARDIZES INFORMATION EQUIPMENT ACROSS ALL PROGRAMS, AND REDUCES THE COSTS THROUGH COMBINED PURCHASING. THIS OFFICE PROVIDES FEMA WITH THE ABILITY TO PROVIDE A CENTRAL POINT OF CONTACT WITHIN THE EXECUTIVE BRANCH RESPONSIVE TO THE INFORMATION NEEDS OF EMERGENCY MANAGERS AT ALL LEVELS OF GOVERNMENT. IT ALSO ALLOWS US TO IMPLEMENT THE PROVISIONS OF THE PAPERWORK REDUCTION ACT IN THE MANNER CONGRESS INTENDED.

MY FURTHER COMMENTS HERE REFER TO THE REALITIES THAT MAKES THE SUCCESSFUL IMPLEMENTATION OF FEMA'S NEMS A MAJOR AGENCY REQUIREMENT. IN SHORT, NEMS CAN BE CONSIDERED THE NERVOUS SYSTEM OF THE FEMA INTEGRATED EMERGENCY MANAGEMENT SYSTEM WHICH ALLOWS US TO SUPPORT THE U.S. EMERGENCY MANAGEMENT AUTHORITY OR EMA, WHICH CONSISTS OF THE PRESIDENT, VICE PRESIDENT, AND DIRECTOR, FEMA, IN THEIR NATIONAL EMERGENCY MANAGEMENT AUTHORITY FUNCTION. ALL THE MAJOR INFORMATION SYSTEMS IN FEMA BECAME A PART OF NEMS. THE NEMS CONCEPT INCLUDES THE IDEAS OF UBIQUITY, COMPATIBILITY, AND ENDURABILITY.

ALMOST AS I SPEAK THE TECHNOLOGY IS CHANGING. ALSO, WITH THE KIND OF MISSION FEMA HAS, ALMOST AS I SPEAK THE FEMA USER ENVIRONMENT OF INFORMATION SYSTEMS IS CHANGING. THIS HAS BEEN THE CHALLENGE THAT WE HAVE BEEN FACING, AND I BELIEVE, QUITE WELL.

CONCERNING TECHNOLOGY CHANGES, WE HAVE EVEN FOUND IT MORE CONVENIENT TO CHANGE OUR TERMINOLOGY. WHEN WE SPEAK OF INFORMATION SYSTEMS WE INCLUDE WITHIN IT THE AUTOMATIC DATA PROCESSING MAIN FRAMES, MINICOMPUTERS, MICROCOMPUTERS, WORD PROCESSING, DATA TELECOMMUNICATIONS AND NON-DATA TELECOMMUNICATIONS WHICH INCLUDES RADIO, TELEPHONE SYSTEMS, VOICE AND VIDEO TELECONFERENCING AND ELECTRONIC DISPLAY SYSTEMS AND MOST IMPORTANTLY--PEOPLE.

PEOPLE ARE JUST AS MUCH A PART OF THE INFORMATION SYSTEMS AS ARE THE ELECTRONIC CAPABILITIES. I ADD TO THIS, SINCE THE PEOPLE ASPECT ENTERS IN SO STRONGLY, THE METHODS AND PROCEDURES NECESSARY TO INTERFACE PEOPLE WITH THE TECHNOLOGY. IN THE SUPPORT CATEGORY THE TRAINING OF PEOPLE TO USE ELECTRONIC SYSTEMS IS PARAMOUNT. THE WORDS "COMPUTER LITERACY" HAVE ENTERED INTO PEOPLE VOCABULARIES NOW AND IMPLIES THAT THE LACK OF BEING LITERATE ABOUT COMPUTERS IS A PERSONAL, INDIVIDUAL, DEFICIENCY.

WE HAVE BEEN QUITE BUSY SINCE WE LAST PARTICIPATED WITH THIS COMMITTEE. BUSY IMPLEMENTING NEW TECHNOLOGY INFORMATION SYSTEMS IN THE SHORT TERM TO REPLACE AGING AND NEGLECTED SYSTEMS. NEGLECTED IN THE SENSE THAT CAPITAL IMPROVEMENTS SO NECESSARY TO ENSURE OUR EMERGENCY MANAGEMENT SYSTEMS ARE UP TO THE TASK OF SUPPORTING THE NATION'S NEEDS FOR RESPONSIVENESS TO EMERGENCY EVENTS OF ALL KINDS HAD NOT BEEN MADE. THAT HAS CHANGED WITH THIS ADMINISTRATION. WE HAVE BEEN BUSY PLANNING AND WORKING TOWARD UPGRADING OUR EXISTING SYSTEMS THAT WE MAY BE PREPARED WITH THE BEST CAPABILITIES POSSIBLE TO RESPOND TO THE FULL CONTINUUM OF EMERGENCY SITUATIONS THAT MAY OCCUR. YOU WILL BE HEARING ABOUT SOME OF THE SPECIFICS FROM FEMA EXPERTS DURING THIS TWO DAY SESSION.

AS A SPECIFIC EXAMPLE OF OUR EFFORTS IN THE ADP AREA, CONCEPTUALLY THE ADP SERVICE EMPHASIS OVER THE YEARS HAS BEEN BATCH OPERATIONS ORIENTED DURING THE 1960'S, INTERACTIVE TIMESHARE OPERATIONS WAS STYLISH IN THE 1970'S AND WE ARE NOW, FOR THE 1980'S, IN THE ERA OF DISTRIBUTED DATA PROCESSING SYSTEMS (DDP). HOWEVER, UNTIL THIS ADMINISTRATION TOOK THE GAO GOVERNMENT OWNED COMPUTER REPORT OF 1980, AND RAN WITH IT, WE WERE TWO AND ONE-HALF COMPUTER GENERATIONS BEHIND THE TIMES. I AM PLEASED TO REPORT THAT THE AGENCY'S MAJOR ADP SYSTEMS WILL BE UPGRADED AT FEMA NATIONAL HEADQUARTERS BY DECEMBER THIS YEAR AND IN THE REGIONS BY MARCH OF 1984 AS OUR FIRST PHASE OF A DISTRIBUTED DATA PROCESSING SYSTEM IMPLEMENTATION. THIS DDP EMPHASIS IMPLIES THE TOTALITY OF INFORMATION SYSTEMS AS WE USE THE TERMS IN FEMA. IT WILL ENVELOP ALL THE NODES AT ALL LOCATIONS, THE CAPABILITIES TO SERVE THE NEEDS AT THOSE LOCATIONS, AND THE NEED TO COMPATIBLY INTERFACE WITH THE REST OF THE NATIONAL SYSTEMS.

IN FEMA WE CANNOT ACCURATELY PREDICT WHERE THE NEXT HAZARDOUS EVENTS WILL OCCUR SO OUR GEOGRAPHIC PROFILE IS THE CONTERMINOUS UNITED STATES, ALASKA, AND U.S. INSULAR POSSESSIONS. WHATEVER WE PUT IN PLACE MUST BE A MIX OF FIXED AND TRANSPORTABLE CAPABILITIES AND THE DDP NETWORK MUST BE FLEXIBLE ENOUGH TO EXPAND AND CONTRACT ACCORDING TO THE NEEDS WHEREVER THEY ARISE.

THE DIMENSIONS OF ENDURABILITY AND RELIABILITY ARE OBTAINED IN TWO WAYS. ONE, WE HAVE ADOPTED A TELECOMMUNICATIONS CONCEPT OF MULTI MEDIA, USING AS MANY DIFFERENT MODES OF COMMUNICATIONS SERVICE POSSIBLE AND TWO, CONTROLLED DUPLICATIONS OF CRITICAL DATA AT MULTIPLE LOCATIONS.

TODAY FEMA'S INFORMATION SYSTEMS CONTAIN ADP CAPABILITIES THAT ARE CHARACTERISTICALLY DISPERSED SYSTEMS RATHER THAN FULLY DISTRIBUTED SYSTEMS. WE ARE MOVING TOWARD THE TRUE DDP SYSTEM IN ACTIONS WE ARE TAKING NOW. EVEN THE OLD BUZZ WORDS, "OFFICE AUTOMATION" ARE USED IN FEMA ONLY TO CONNOTE FEMA INFORMATION SYSTEMS IN THE OFFICE ENVIRONMENT. WE ARE STRIVING FOR FULL COMPATIBILITY. ALSO, THE SYSTEMS WE ARE PUTTING IN PLACE WE EXPECT TO BE TRANSPARENT TO THE USER'S NEEDS AND USE.

THIS MEANS THAT WORD PROCESSORS WE ARE PUTTING IN PLACE WILL HAVE THE CAPABILITY TO COMMUNICATE AND MAY ALSO BE USED, WHERE FULL TIME DEMAND FOR WORD PROCESSING IS NOT NEEDED, FOR APPLICATIONS PROGRAMMING, PERFORMING DATA PROCESSING FUNCTIONS. WORD PROCESSORS WILL BE ABLE TO COMMUNICATE WITH MICROCOMPUTERS AND BOTH WORD PROCESSORS AND MICROCOMPUTERS WILL BE ABLE TO COMMUNICATE WITH MAIN FRAMES AND COMPATIBLY INTERFACE WITH ALL ELEMENTS OF OUR DDP.

OUR DDP WILL BE A MIX OF FIXED AND TRANSPORTABLE SYSTEMS USING MINICOMPUTERS AS THE HUBS OF THE NETWORK AND WORD PROCESSORS, MICROCOMPUTERS AND VARIOUS DUMB AND SMART TERMINALS WILL BE INTEGRATED INTO THE SYSTEM.

SIGNIFICANTLY, WE ARE TARGETING OFF-THE-SHELF SOFTWARE AND COMMERCIAL GRADE EQUIPMENT THAT WILL MAKE IT RELATIVELY EASY FOR OUR NATIONAL SYSTEM, NEMS, TO INTERFACE WITH ANY STATE AND LOCAL CAPABILITIES AND EVEN THOSE PRIVATE SECTOR ELEMENTS WITH WHOM WE MAY HAVE NEED TO COMMUNICATE.

IN CLOSING, I WOULD ADD THAT AS THE AGENCY REPRESENTATIVES STATED IN THE 1981 HEARINGS, WE HAVE SIX GOALS FOR THIS YEAR. THIS AGENCY IS COMMITTED TO DEVELOP INFORMATION SYSTEMS TO SUPPORT BOTH OUR PEACETIME AND WARTIME RESPONSIBILITIES. WE INTEND TO COMMIT ALL RESOURCES NECESSARY TO ENSURE THAT WE DEVELOP EMERGENCY MANAGEMENT SYSTEMS REQUIRED TO HELP MINIMIZE LOSS OF HUMAN LIFE AND PROPERTY BY THE AMERICAN PEOPLE.

THANK YOU.

Description

NATIONAL EMERGENCY MANAGEMENT SYSTEM

(NEMS)

Attachment To

Statement By William F. Williams
Director
Emergency Operations
Federal Emergency Management Agency
Before The
Subcommittee On Investigations And Oversight
Committee On Science And Technology
U.S. House Of Representatives
November 16, 1983

INTRODUCTION

The Federal Emergency Management Agency (FEMA) has comprehensive responsibilities for managing the civil aspects of emergencies affecting the United States. The dimensions and complexity of that mission involve a wide variety of management functions, all critically dependent upon information. A correspondingly comprehensive mechanism of communications and information systems is required in order to perform those functions. Such a mechanism is being implemented by FEMA in the form of an integrated National Emergency Management System (NEMS) that is capable of supporting the full range of information requirements in every phase and type of activity associated with emergency management.

Purpose

This overview has a twofold aim. On one hand, as part of a larger task, the objective is to establish a general basis and framework for developing the subsequent task increments leading to the design of a target system architecture. On the other, a separate concurrent objective is that the results of the overview task provide the substantive content of a formal publication explaining the NEMS concept.

Scope and Approach

To achieve the broad objectives outlined above, the overview examines the NEMS generically from three perspectives. The first is from the viewpoint of the underlying concept, cast in terms of the nature of the NEMS, it's capabilities, and significant operative properties characterizing the system. Also described is the functional relationship of NEMS to the Integrated Emergency Management System (IEMS) concept.

The second perspective focuses on the major components making up the NEMS, including both existing and planned assets. These system components are identified according to three categories, as follows:

- o Key nodal facilities where management processes are conducted
- o Principal telecommunications systems available
- o Information systems and their associated ADP equipment.

Finally, the NEMS is viewed from the perspective of how the system components fit together. The following main areas of its internal and external structure are outlined:

- o Organizational configuration of the core elements of NEMS proper, down to and including the FEMA Regions
- o NEMS interfaces with other Federal agencies (civil and military)
- o Interfaces with State and local governments

NEMS CONCEPT AND DEFINITION

Background

FEMA is the focal point within the Federal Government for dealing with a wide spectrum of emergencies affecting the United States in peace and war. It has a central role in both domestic and national security emergencies, ranging from natural and technological disasters through wartime nuclear attack. FEMA's statutory responsibilities with respect to these emergencies involve: mitigation (prevention, risk reduction, and effects limitation); preparedness (policy, planning, programs, training, and education); response (active coordination of on-scene activities during an emergency); and recovery (restoring affected areas to normalcy). It thus deals with all emergencies in a comprehensive time frame: pre-emergency, trans-emergency, and

post-emergency. And its responsibilities include the coordination of emergency activities through all levels of government -- Federal, State, and local -- and the private sector of the Nation.

Broadly viewed, the basic mission of FEMA is to protect the population and resources of the Nation and preserve the continuity of constitutional government. This broad and complex mission requires a supporting emergency management system of corresponding breadth and complexity. An extensive and elaborate mechanism consisting of communications networks, information systems, and physical facilities is needed. All of the elements of that mechanism have to be rationally organized to form an integrated system capable of supporting every aspect and phase of FEMA's emergency management responsibilities. Recognition of these needs led FEMA to formulate the concept of a National Emergency Management System (NEMS) and to initiate steps to make the concept a reality.

NEMS Definition

The FEMA National Emergency Management System (NEMS) is the comprehensive mechanism for gathering, processing, and exchanging information in support of the emergency management community at the Federal, regional, State, and local levels of government. It consists of the physical facilities, telecommunications, and information systems required for FEMA's vital management mission. Information is the key commodity of the NEMS -- information for decision making and its execution at all levels of government, in all forms of emergency, in all time phases, and throughout the entire range of mitigation, preparedness, recovery, and response functions.

Specific Features of the NEMS

The following requirements drive and shape the development of the NEMS:

- Existing communication networks, information systems, and physical facilities are to be utilized to the maximum and are being integrated into the overall development of the system.
- Development of the system will follow a phased, evolutionary sequence -- beginning with the integration of existing systems and near-term improvements to them followed by long-term improvements aimed at optimizing its future capabilities.
- Special emphasis is being placed on system endurability and continuity of capability. The NEMS must be able to survive and function in a wide spectrum of emergency environments.
- A central, continuing aim of FEMA is to build a bridge between national security imperatives and domestic emergency needs. The NEMS must serve this aim by developing effective linkages between its elements.
- The NEMS must be able to interconnect and operate with other Federal, State, and local systems that serve national security and emergency preparedness functions.

All of the foregoing emphasize that the NEMS must possess the following systems performance attributes:

- Connectivity
- Endurability
- Interoperability with interfacing systems
- Flexibility (including use of multi-media and variable network configuration)
- Reliability
- Responsiveness
- Capacity

Relationship of the NEMS to the Integrated Emergency Management System (IEMS)

Correlative with the development of the NEMS, FEMA has embarked upon a long-term strategy for integrating management functions and activities across the full spectrum of emergencies. This includes natural disasters such as tornadoes, hurricanes, floods, and earthquakes; technological disasters, such as explosions, release of hazardous materials, accidents involving radiological materials, and possible nuclear power plant accidents; resource shortages; and possible nuclear attack. The resulting Integrated Emergency Management System stresses the preparedness functions common to all emergencies, including planning, warning, communications and control, population movement, food, shelter, medical care, and the provision of other critical resources. It also stresses the need for achieving stronger linkage and cohesion among Federal, State, and local emergency management agencies in carrying out their plans, programs, and operations.

The NEMS will serve as a major mechanism for implementing the IEMS concept. It will aid in its development by supporting FEMA program offices with improved communication and ADP capabilities for program planning and operation; by improving coordination among Federal agencies involved in response to various emergencies; by facilitating the exchange of information between and among Federal, State, and local levels of government and the private sector; and by standardizing management information systems and communication protocols among the agencies and organizations participating in mitigation and preparedness programs for major domestic and national security emergencies.

General Description of the NEMS

The NEMS is one of the principal instruments by which FEMA fulfills its basic mission and responsibilities. It supports FEMA and the entire emergency management community -- including Federal, State, and local governments; private industry; and volunteer organizations throughout the Nation -- by facilitating the rapid and orderly flow of emergency-related information between and among these various participants.

The purview of NEMS essentially coincides with that of FEMA as a whole. The NEMS thus deals with the entire continuum of FEMA information requirements -- covering the principal areas of FEMA responsibilities in all emergency environments and all time phases. The principal areas of responsibility include disaster mitigation, resource management, preparedness planning, communications and warning, continuity of government, nuclear civil protection, civil security, crisis management, emergency operations reporting, emergency public information, damage assessment and radiation defense.

In essence, the NEMS is the system that acquires, processes, and delivers information on which decisions can be made. One of its principal functions is to assist the National Emergency Management Authorities, the FEMA Director, and other key Federal decision makers by providing the information they need to formulate and implement protective policies, plans, programs, and operations. It must provide both the information base and the communication media to support the decision making and decision implementation processes at the highest levels of government. It must be able to perform in all operating environments and in all time phases -- pre-emergency, trans-emergency, post-emergency. Further, it must provide for the selection and utilization of the most suitable system modules by decision-makers, as emergency situations dictate. The NEMS also provides FEMA program offices with the communications and ADP support needed in their planning and operational responsibilities. And it serves as the focal point of queries to and from outside agencies and organizations.

In general then, the NEMS is designed to provide the information base and the means of communication for fulfilling those functions essential to emergency mitigation, preparedness, response, and recovery. It provides a single, recognized point of contact and the mechanism whereby national resources can be brought quickly and effectively to bear on all aspects of emergency management problems.

Mr. GORE. Thank you very much.

In considering the necessary linkages that FEMA must have with State and local emergency response units, are you going to conduct any special training with State and local people in how to—how to communicate with your system during a crisis? You say in your statement that—that you're going to use off-the-shelf software and commercial-grade equipment in order to make it easier for State and local people to communicate with you, but recognizing that the key element is people, how do you plan to approach the problem?

Mr. WILLIAMS. Yes, sir, I'll let Joe Mealy answer that.

Mr. MEALY. The system that Mr. Williams described is the Federal portion of the system. Now, what we need to take into consideration, and are taking into consideration, are the existing emergency systems at the State and local level. One thing we're doing in that sense, other than—in addition to providing the financial assistance to upgrade their systems at our training center at Emmittsburg, at the Emergency Management Training Center, we have brought in communities, the entire cadre of the decisionmaking process of a community, where they walk through, under simulated conditions, emergency situations to facilitate the exchange of information among themselves and better recognize in that kind of a training session the need for exchange of information with neighboring communities or with those at the State level or at the Federal level.

We think through this kind of a process, we've worked with a number of very interested communities where their representatives, city manager, the chiefs of their various emergency services have worked as a team under emergency stress—or at least simulated emergency stress conditions. It's through that process that we think we can better bring home to them the need for them to address the upgrading that they must do in their community with the systems that they have in place.

Mr. GORE. Well, that sounds good, but you obviously can't do—you can't bring every community in for—for a training session. Suppose a disaster occurs in a community that hasn't—how many have you brought through that?

Mr. MEALY. Well, your observation is correct, and I don't want to leave you with the impression that that's the sole effort at the training facility. The basic and primary effort is a train-the-trainer program, where literally we bring in people and create that—that skill and knowledge to go out and then replicate that kind of training throughout the United States and basically in that way attempt to reach as many communities as possible.

I don't profess to—to convey to you that we'll reach all the communities or that we can prophesy where the next disaster's going to hit where that kind of training will do some good. But the front end is that the communities are themselves recognizing the need for this kind of interaction among their emergency services and are taking advantage of these opportunities.

States on their own, and I—generate their own exercises. Communities that are concerned with emergency management generate their own exercises and our job is to reinforce those initiatives as well.

Mr. GORE. Well, you say "train the trainers." Who in—who in a community is going to get—let me rephrase the question: Who are you training to train communities that you haven't brought up to—to go through your demonstration?

Mr. MEALY. I think the approach is better described this way: We describe the offering we can make. We then feel that it's the elected head of Government, be it at the State level—and I'm not saying the Governor personally, but certainly his representative, to make the determination of who he wants to send up that would be the best transfer representative at the State level. The same thing at the community level.

We basically are expecting the States to carry a good bit of the transfer capacity of the——

Mr. GORE. You are waiting for the States to take the initiative to——

Mr. MEALY. We're not having to wait. As a matter of fact, I—I saw a report from our training center just this past quarter where the attendance at Emittsburg exceeded anything in the previous record of FEMA with regard to a number of students that were trained at Emittsburg. So it's not a question of going out and trying to sell the idea; it's a question of accommodating the demand that's there.

Mr. GORE. How many States have taken advantage of this program?

Mr. MEALY. That training program reaches to all 50 States.

Mr. GORE. Have you had participation——

Mr. MEALY. We have.

Mr. GORE [continuing]. From all 50 States?

Mr. MEALY. We have.

Mr. GORE. What is the capacity of this facility now? Is it adequate?

Mr. MEALY. No; I don't believe it is adequate to meet the demand and I think the agency is looking at plans in the future to be proposed within the context of future budget presentations with regard to expansion of the facility.

The facility alone is not the sole source, nor do we want it to be the sole source of training opportunities. It—it basically is the center post from which the training can eminate, then, out to the State and then to the community level.

Mr. GORE. All right. Let me ask you, Mr. Williams, to amplify for the subcommittee on EICC and its multiple roles.

Mr. WILLIAMS. Yes, sir, I'd be very glad to. I'd like Ash Holmes to respond since he is my manager of the EICC.

Mr. HOLMES. I'm delighted to respond to that question, Mr. Chairman. It was recognized early on in the formation of FEMA that in carrying out its principal role that a central point for the management of information was essential and with the proponent agencies that made up FEMA coming together in a single headquarters allowed us to move into a process of development and design for such a facility.

FEMA's missions have been increasing. There's a recognition that the Emergency Information and Coordination Center is not just a facility to provide for FEMA program management, but to provide to the executive branch in time of a crisis, a national crisis,

a focal point for bringing together and responding as a government to that event, and of course, those requirements have been translated into space, people, equipment, technology in the most sophisticated sense. That was substantiated, reinforced by our participation in the Cosmos 1402 event, in which we carried the lead for the Federal Government and recognized that what we were doing was the right thing and that it validated our—our notion of how we were going to use that technology, particularly in the transportation of information for decisionmaking, for the development of real-time interactive models that could be used in a real-time event, which we do have, and will be bringing online other capabilities as time goes on. It will never be complete in a sense because as someone mentioned earlier, the technology is moving at such a rapid pace.

But we have taken advantage of building what we think will be a 21st century capability.

Mr. GORE. Well, now, in pursuing that capability, does your protocol or routine for handling one of these things include the identification of other decisionmaking loops at the State and local level, and in the private sector, in an effort to identify key individuals in those loops and establish communication with them and coordinate the response during a crisis?

Is that part of your protocol?

Mr. HOLMES. Normally our response to that kind of event is decentralized. It can be centralized, but the normal mode of operation is to carry out a decentralized execution with centralized policy direction.

Mr. GORE. Well, tell me what that means?

Mr. HOLMES. That means that we have 10 regions that are microcosms of each other and they actually provide the management of an event working in support of State and local government in their response to the event. Now, what I'm saying is if there is a national-level event, such as the Cosmos event, that could very quickly be centralized and policy and operations run from Washington, which is not the norm.

We do, on a routine basis, interact with State and local government in carrying out the disaster relief program, which is a—is a very institutional program which the States understand. There is a good relationship there, and so we essentially—our policymaking body at the national level can make the transition, though, into an operational mode.

We do also have, as you have alluded to earlier, the establishment of networks within the—at the national level, whereby we relate to other agencies who have expertise, who have data and data transfer that will accommodate that total response effort. So there is a networking effect in which there's overlap interaction between and among the Federal parties.

That also transcends down to the regional level where you have the regional counterparts who are also in support of and coordinate with State and local government in response to those events, where there is a national requirement to do that.

Mr. GORE. Well, I—I guess I'm asking a slightly different question. Let me just take it at the regional level. Does the protocol include a requirement to identify the key people in these other deci-

sionmaking loops and establish communication with them very early in the management of the crisis?

Mr. HOLMES. The answer is yes. As a matter of fact, in the planning for any number of events, such as radiological events, that process is going on as we speak.

Mr. GORE. Yeah.

Mr. HOLMES. There are fairly intense activities going on where we know we have a potential for serious national problems in the earthquake areas where there's been a very close interaction between those players, where the State has identified, or local governments, a particular hazard, and we work very closely with them as part of our preparedness side of the IEMS program, in preparing for, mitigating, and of course, obviously being prepared to respond to the event should it occur.

Those interactions having been put in place before the event, which is, I think, the point you're trying to make, that those relationships do exist. The network is there.

Now, in every instance, we can't anticipate in our wildest imagination the kind of things that might happen——

Mr. GORE. Yeah, sure.

Mr. HOLMES. Times Beach was something that no one could anticipate. We'll always be having that kind of event, Love Canals——

Mr. GORE. We can quarrel about that, but——

Mr. HOLMES. Right.

Mr. GORE [continuing]. Your point's valid. Does the EICC allow coping with multiple crises simultaneously?

Mr. HOLMES. We have the capability of dealing simultaneously with five unrelated events. Now, that capability has not been tested yet, but it's been built into the facility. We will soon know whether or not we can do that.

Mr. GORE. If it gets beyond that, we'll probably just hang it up anyway.

Mr. HOLMES. All right. [Laughter.]

Mr. GORE. All right.

Let me suspend my questions and call on my colleague, Mr. Durbin.

Mr. DURBIN. I'm going to pass at this time.

Mr. GORE. All right, let me ask a couple more questions.

How does a center such as yours integrate long and shorter term projections dealing with emergency preparedness, and can the use of computerized modeling techniques be helpful in such an effort?

Mr. HOLMES. We currently are working a simulation model which will form the basis for a generic model for simulations on—in the first instance, a nuclear-plant accident. That will be expanded to deal with the hurricane type of event with inputs from other Federal agencies who have models that will interact with that one, and eventually to dam-failure problems and it can go on ad infinitum.

That model is used essentially to—to test the plans that have been developed as a tool which will be available at the regional and State level for them to validate what they've done in the planning process by simulating or iterating a number of different kinds of events that could occur, and we think that the modeling is a step

in the right direction, and that model then could transition into a real-time management tool by merely inserting the actual data as the event occurs and give managers at the operating level a tool which they never had before.

Mr. GORE. So you found them useful so far?

Mr. HOLMES. Very much so.

Mr. GORE. Uh huh.

Mr. HOLMES. And it will be used extensively in a forthcoming exercise with the State of Florida.

Mr. GORE. Uh huh. Presumably it could get sophisticated enough to incorporate Dirk the Dragon technology—I may—Dirk the Daring, the new twin laser disk interactive—I'm getting ahead of myself there. [Laughter.]

What new technologies do you see forthcoming that might actually be of help in improving your handling of some of these management problems faced by those at the Federal, State, and local levels?

Mr. HOLMES. I can't speak to what new technology might be coming on, because I'm not that conversant with what—with what's on the R&D, but we are moving into an area where we are going to take advantage of what we call an electronic message distribution system, and try to get away from the conventional way of doing business by passing paper through facsimile or by telephone, where we'll transmit on a computer to computer on a distributed base information, forward to the decisionmakers for the policymakers, and this will have to be, of course, after we overcome what I consider a technological culture shock that we're going through as we introduce these kinds of technologies.

To us as a very new agency, we are moving into a—into an arena that we're not that accustomed to working in and we need to go very slowly until we can adjust ourselves to working in a digital world, an electronic world. Once people become confident and feel secure in that world, rather than their paper world, we will begin to move very rapidly into some of the more advanced stages of technology, but we don't want to make that quantum jump from the 16th century to the 21st, if I may use that analogy.

Mr. GORE. Yes.

Mr. WILLIAMS. Sir, I'd like to have Mr. Campbell respond to that——

Mr. GORE. All right, please.

Mr. WILLIAMS [continuing]. As it relates to telecommunications and the multimedia that we're looking at, such as media bursts and digital switching.

Mr. CAMPBELL. One of the things, Mr. Chairman, that we talked about in the 1981 hearings was these kinds of things we're looking toward, which were geared toward not requiring a breakthrough in technology, but learning how to use the technology that we have available to us and do the modernization.

I think you made the comment about supply-side money management in—in our equipment procurement programs, and that's exactly what we needed, and over the last 2 years, that's what we did.

We are very sensitive to our dependency on the common-carrier linkages that we have. We have backup with HF radio and again,

multimedia, as Mr. Williams mentioned, was one of our design criteria. So we're doing a mix of satellite technology, improved HF, meteorburst, which is not new technology, it's quite old and has been used, but there's a resurgence in interest now. In fact, we find ourselves in the interesting position of—of supporting DOD in—in supplying some of the data that we have generated as a result of our meteorburst-testing program.

We're working very closely with readiness commands, so there's another linkage in prior to an event because RedCom is tied in with us very closely on a lot of our programs. And then LF, low frequency, as well, and linkage there between us and the Air Force.

So if—if perchance one of these modes goes out—and earlier comments were made about the dependence on satellite, well, we're not going to totally depend on satellite. We're not going to totally depend on common carrier. We're not really going to depend totally on any single media, but we've sized our systems and our system engineering so that we can break down and put a damper on that fire hose of information so that the critical essential elements are being sent over the FEMA systems, regardless of the situation.

And again, we're interested in new technology and we follow it, as Mr. Williams said, in terms of—of integrating our word processing ADP, telecommunications, et cetera. We are using digital techniques as well.

But again, we're bringing a paper-and-pencil kind of game up to what we want to use as the eighties and the nineties concept of operations to support all of our—all of our missions.

Mr. GORE. Well, thank you very much. I could ask a number of other questions, but I'm anxious to—to get through our hearing so that our participants can begin the workshop part of the day.

Let me conclude this panel by saying, Mr. Williams, that I'm impressed by the progress that is evident you and your staff have made. I think that really a great deal of progress has been made since we last looked closely at this subject, and I want to congratulate you on your work over there, and we look forward to continuing a cooperative working relationship with you.

Thank you very much.

Mr. WILLIAMS. Thank you very much, sir.

Mr. GORE. Let me invite our next—our final four witnesses to come together at the witness table. Robert F. Littlejohn, deputy director of the Office of Civil Preparedness in New York City; Dino Brugioni, from Falls Church, Va.; Dr. Jerome E. Dobson, from Oak Ridge, by way of Tempe, Ariz.; and Robert Wilkerson, director of the Division of Public Safety, Planning and Assistance, in Tallahassee, Fla.

I want to welcome all of you and give a special welcome to my fellow Tennesseean on this panel. Without objection, the entire text of your prepared statements will be included in the record in full. We invite you to summarize if you care to.

Mr. Littlejohn, we'd like to begin with you. We appreciate the obvious amount of time and energy that went into your preparation for today's hearing. We appreciate that and we invite you to lead off this panel.

STATEMENTS OF ROBERT F. LITTLEJOHN, DEPUTY DIRECTOR, OFFICE OF CIVIL PREPAREDNESS, NEW YORK; DINO BRUGIONI, FALLS CHURCH, VA.; JEROME E. DOBSON, TEMPE, ARIZ.; AND ROBERT WILKERSON, DIRECTOR, DIVISION OF PUBLIC SAFETY, PLANNING AND ASSISTANCE, TALLAHASSEE, FLA.

Mr. LITTLEJOHN. Thank you, Mr. Chairman. I have some Vu-Graphs here.

Mr. GORE. Good.

Mr. LITTLEJOHN. Can I have the lights, please? Thank you. [Vu-Graph.]

I think the committee would be best served if I could give you a feeling for what the posture of New York City is as far as its emergency management structure, and I think this would be best done by indicating where New York City was back in the 1977 blackout and bringing us on through what took place after the blackout.

In 1977, as I'm sure most of you remember, July 13 was the date, New York City was struck by a blackout which lasted some 25 hours. It was characterized by hundreds of people stuck in elevators, widespread disorder, hospitals operating on backup generators, many of which did not work. We had approximately 2,000 commercial establishments broken into and looted. We had 1,000 fires and we ended up with two fatalities, approximately 204 people injured, and 436 police officers injured.

As the chairman brought out in the beginning, as hindsight always has it, after it was over, the comments began coming in and everyone began analyzing it. There were mixed reviews. Some praised the police for making 3,000 arrests; others scorned them for being too lenient on looters and vandals. Some praised firefighters for their quick response; some scorned them for tardiness on their part.

However, the bottom line was, the question came out, how was New York City prepared to handle such a devastating crisis? Basically everyone felt at this point that New York City was ill-prepared and here's basically what we had.

We had a lot of city organizations performing their respective functioning—function—and performing it well. However, there was no nucleus. There was no organization pulling all these agencies together.

The present administration, under Mayor Koch, came in and decided that we were going to put together a doable, a workable, a strong emergency management structure. And that brought us up to this. We set up a structure—the office of civil preparedness was in existence, however, at that point, it was simply undermanned and not really involved in developing plans for day-to-day emergencies.

What this office does now is on a daily basis, they monitor events worldwide and they question, what if something was to happen in the city of New York? The personnel look at probabilities impact and if it necessitates, they begin developing contingency plans.

In addition, they're responsible for managing outside organizations which make up our emergency coordinating section. The emergency coordinating section is upper middle-management per-

sonnel from all city, quasi-city, and private organizations that are pulled together during an emergency.

It also has a press information unit. We found that during a disaster, it's imperative that the voice going out to the public come from one unit, one individual. We work in conjunction with the mayor's press office to see that we do not have a duplication or conflicting statements going out to the public, causing even more confusion.

In addition, we put in what we call a public inquiry unit. Its initial purpose is to inform the public of what's going on in a disaster. We give them telephone numbers so that they can call us and we can indicate the exact status of the disaster and those people who may have been injured and taken to hospitals.

Furthermore, it's reducing the heavy burden that all so often happens when we have a disaster on police, emergency medical, and fire communication lines. So this immediately goes out over the National Broadcasting System.

Then, finally, we have our mayor's emergency control board, made up of the mayor as the chairperson, the police commissioner as the director, myself as the deputy director, and all those commissioners that the mayor feels necessary to mobilize during a disaster.

We also bring in the presidents of private corporations. If it is a blackout, the president of Consolidated Edison, who's our major utility. We bring in executives from the phone company and on.

What we've done, though, we've solidified this structure and we put together what's called the mayor's management plan, and it is basically the framework for addressing any type of crisis within the city of New York and it's laid out in a phasing structure.

A phase 1, we have the office of civil preparedness; it goes on the alert and begins to monitoring. Back in August, we had a blackout in the garment district, which I'll mention briefly in a minute, and that blackout, we began monitoring about 2 in the morning. It started out as a small fire. However, as it progressed, by 7, we went into what we call a phase 2, and we bring in those middle management people that make up that emergency coordinating section.

It was not the type of emergency that necessitated bringing in all the commissioners. And somebody mentioned earlier about the centralization and decentralization of power. This structure lends itself to a good decentralization style that we don't go into the phase 3 and bring in the mayor and the commissioners unless it's a really heavy situation in which policy issues have to be addressed.

Now, in contrast to the 1977, although this may seem like a microcosm, the blackout which took place back on August 10, in our garment district, it brought a $15 billion business to a halt for a number of days. but what actually took place is we had that nucleus; we had the structure which brought in police, health, human resources, emergency medical, fire, transit authority, people from the mayor's office, all under one umbrella.

The situation was managed and managed well. And I had a statement here I was going to read—it's in the text—from Mr. Frank Petrone, the Regional Director of FEMA, who basically said that, "The city resources"—the city agencies—"did an outstanding job, to say the least." And he thought it was just the way people

functioned and how smooth it was done, without very many ripples. There were no reports of crime. There was no looting. There were no injuries. There were no arrests.

It had to do with the quick mobilization of resources under one head, and at that time, it was myself. What's going on now is, due to budgetary constraints, the city of New York has not gotten into the area of advanced technology. Now, don't misconstrue this. Our police have computers; we've had them for years. Our fire department, our emergency medical—they all have computerized communication systems.

However, the actual emergency management structure in the city of New York is just beginning to enter into that. We just received allocations to purchase a minicomputer and we have just laid out our plan of what we're going to do with it.

We're going to start out with a resource, a resource allocation list. What happened back in August during the blackout is we had to go from agency to agency to find out who had the generators, where were the generators, are they wheel-vehicle generators or do we need trucks? Our resource allocation is going to indicate every piece of equipment the city has, or is leased, where that piece of equipment lives and how we get it to the disaster site.

In addition, here we have firefighters using police helicopters. It's going to insure that we do not have a multiple assignment of a piece of equipment by the use of this. It's also going to indicate to us when—indicate when we run into a shortfall and we're running out of certain types of equipment.

For example, we had a big blizzard back in February, characterized by the press as the "Blizzard of 1983." If we had this system in place, we would have known where all those snowplows belonging to agencies—not sanitation, who has the primary responsibility—but park department, general services, transportation. We would have known where they are and we would have assigned them once and this model would have taken care of the rest.

The next model we're very concerned about, is that a terrorism response? New York City brought in a new year with a devastating terrorist attack by the FALN on new year's eve of last year. They hit police headquarters, the Federal building complex at 26 Federal Plaza in downtown Manhattan. They hit our Federal court building in Brooklyn and they hit the Federal detention center.

We are working with intelligence folks right now to determine what variables we can develop and put together a model so that—we realize most terrorist attacks are unpredictable, but if we know there is one and it's against a government building, and very often, initially, if we're able to get the device before it goes, we know what type of group or what group put it down, we could then harden other targets such as other Federal buildings, city buildings, city hall or Gracie Mansion, and hopefully prevent loss of life and property damage. We—three police officers of the bomb squad were very seriously injured during these explosions.

So this is our second priority.

We then go to move on and computerize our evacuation planning. We have an evacuation plan but we're concerned about multiple evacuations. A few years ago, we had a truck carrying 9,000 gallons of liquid propane gas stalled on the George Washington

Bridge linking New York and New Jersey and it was leaking. It held the city at bay for about 10 hours, and we scrambled around with evacuation plans.

We envision a model that's going to tell us how many people we have to take out, where our transportation resource will be coming from, where the human resource will be coming from, and at the same time, if we have something go down—possibly at Indian Point, we have to take out part of the Burrough of Bronx. We will have an integrated planning model to assist us. [Vu-Graph.]

Next, we're looking to put all city plans on our minicomputer so that they're integrated. Our concern is very often that the fire department may be tapping emergency medical personnel in their plan while the Department of Transportation, and possibly the police, are tapping that same resource for a similar emergency.

We feel with our model that we hope to put together, we will be able to integrate the various plans throughout the city. [Vu-Graph.]

And finally, this was a picture from a labor dispute we had last year. All municipal contracts in the city of New York are due on July 1. Although most people might look at this and say, "Is that a crisis or a disaster?" [Laughter.]

We view the walkout, if it were to take place, in a worst-case scenario of our uniformed forces—police, fire, and correction—as a major disaster. And what we're going to be doing is modeling manning levels to see what—if police officers walk out and we still have detectives and ranking officers, what can we cover?

What if fire officers go along who are members of the same union and walk out with firemen? What if correctional officers walk out? We'll then be taking a hard look at all resources within the city of New York, managerial type, and determine at what point do we have to go to the Governor of the State and say, "We need assistance from outside"?

Mr. Chairman, in conclusion, I feel that since 1977, since that devastating blackout, New York City has come a long way in putting together what we consider a good, strong emergency management organization, with a good—I would say depth—a host of contingency plans to deal with most emergencies.

We have the structure set up to keep our planning mechanism current. We don't review plans once a year, but custodial personnel review them daily. If something happens in San Francisco, they get on the phone to San Francisco, be it the Federal people, the State people, or local people, find out what took place.

When the airline went down a couple of years ago—the Air Florida—1981—went down in the Potomac, we immediately got on with Washington to find out (a), could we be of any assistance, or possibly, you know, what took place? What do we have to look at? There are three simultaneous emergencies. You had the plane, you had the subway, and you had a devastating snow blizzard going on. And we found a lot.

Washington came up after that and worked with us and took a look at what we had, and we were able to lend some help there. So we maintain our system current, but I do admit, when you come to high tech or the advance of the 20th century to technology, to computers, in our actual emergency management, we have been behind the times as a result of budgetary constraints.

Finally, I see some light at the end of the tunnel and this last portion is what we are planning to do with the computer system which we put in place.

[The prepared statement of Mr. Littlejohn follows:]

SUMMARY OF

TESTIMONY PRESENTED BY

ROBERT F. LITTLEJOHN

DEPUTY DIRECTOR, EMERGENCY MANAGEMENT

NEW YORK CITY

INTRODUCTION

Mr. Chairman, I want to thank you for the privilege you have extended to me today to appear before the Subcommittee On Investigation And Oversight to discuss the role of information technology in emergency management. My testimony will emphasize in part New York City's approach to information technology and emergency management, particularly as they relate to the effort to develop information support systems. The use of such systems, to enhance emergency management capabilities, is an issue of critical importance to our Nation's ability to cope with emergencies.

Prior to specifically addressing this issue, I believe it would be meaningful to the committee for me to discuss New York City's present emergency management posture. I think that this could be done best from a historical perspective by looking at New York City's response to the Blackout of 1977 and how this led to the subsequent development of a viable emergency management system. We will then look at how New York City responded to the Garment District blackout of August, 1983 and how the newly developed management system coped with the emergency. The discussion of these events, and the present emergency management system, will serve to introduce the final section of my testimony - our recently developed strategy for the integration of technology into the emergency management system.

29-457 O—84——4

City's performance during post 1977 emergencies; the most recent of which is the 1983 blackout.

Before describing the 1983 blackout, let me begin by outlining the emergency management system which was developed and introduced as a result of the 1977 blackout.

EMERGENCY MANAGEMENT SYSTEM

Our first post 1977 challenge was to develop a structure capable of coordinating and directing all city resources which would ensure that disasters or crises would be effectively managed.

This role was assigned to the Mayor's Emergency Control Board whose responsibility was to insure the effective use of all available city resources during an emergency. The Board is made up of the Mayor as the Chairperson, the Police Commissioner as the Director, myself as the Deputy Director, various Deputy Mayors, Commissioners from appropriate agencies and executives from involved private and voluntary organizations. For example: New York Telephone Company, Con Edison, Red Cross, Brooklyn Union Gas and others.

In addition to that of the Mayor's Emergency Control Board, the role of the Office of Civil Preparedness was clearly defined. The Office of Civil Preparedness would function as an administrative arm of the E.C.B. and during a

Phase II emergency, which we will discuss, would be responsible for the management of all city resources.

A third leg of the organizational structure is the Emergency Coordinating Section, which is made up of managerial personnel from involved agencies. The E.C.S. is supervised and managed by personnel in the OCP under the provisions of the Mayor's Emergency Management Plan. This plan was developed to pull the entire management system together. The emergency management system calls for a three phase level of activation during an emergency. In Phase I, the Office of Civil Preparedness monitors the situation and keeps middle management personnel or liaisons in various city agencies informed of conditions. Phase II activates an Emergency Coordinating Section which brings the middle management personnel to our emergency headquarters. Finally, Phase III brings in the Mayor and all his Commissioners.

Two Auxiliary units worth mentioning are the communication links for the public during a disaster. A Press Information Unit is set up to insure that information goes out to the Press with one voice. All matters going to the press are thereby coordinated. Too often, we have seen individual agencies make press releases or advisories containing conflicting information which confuses the public. The second useful adjunct we set up is a Public Inquiry Unit.

This unit permits the public to call and get information regarding emergencies, including people who are injured. It also relieves the pressure on the emergency police and fire communication lines.

The emergency management system described has been tested during real world situations and has been found to be effective. The most recent situation in which it was implemented was the blackout of 1983. Although this blackout was a microcosm of the 1977 blackout, it served to illustrate how a well organized emergency management team and system can function during an emergency.

BLACKOUT 1983

The August 10, 1983 blackout occurred in the early morning hours when a 12" water main ruptured beneath the City's streets, flooding a Con Edison sub-station. The resulting power outage affected the City's entire Garment District, a vital commercial center with both a permanent and heavy transient population.

In contrast to 1977, coordination during the emergency was effected through the established channels of communication created by the operational arm of the Mayor's Emergency Control Board - the Office of Civil Preparedness.

An Emergency Coordinating Section was established immediately to facilitate communication between the policy makers and the operational levels of government (personnel working at the scene: police, fire, EMS, Telephone employees, etc.) Response was further coordinated by the City's established "Power Failure Contingency Plan" which was familiar to all primary agencies involved. The results were drastically different from 1977 -- no loss of life, no looting or reported crime and no injury to citizenry or police of the City of New York.

Mr. Frank Petrone, Regional Director for the Federal Emergency Management Agency, stated that, "The recent Manhattan blackout was handled brilliantly by the City's emergency forces. I was particularly impressed with the prompt and efficient response of city officials to contain what could have been an extremely serious and volatile situation. I recognize that this accomplishment is due in large part to a combination of professionalism, coordination and cooperation among city officials and city agencies which successfully met the threat to the public health and safety." Mr. Petrone went on to say that "It is clear from the most recent crisis that New York City emergency response capabilities are fully able to deal with almost any situation. This has been demonstrated time and again and we are proud to recognize and acknowledge this all too unique quality."

Mr. Petrone's kind words and the results of this emergency clearly indicate that the City has successfully

designed, implemented, and tested its emergency management system. However, to fully realize our potential the system must now be integrated with modern technological advances to insure its future success. Due to budgetary constraints, we have not been able to realize this potential. However, we have recently received a budgetary allocation for the implementation of a micro-computer system.

We have reviewed where we stand currently and where we are going. With this information we have begun designing applications which we feel will best enhance the Emergency Management capability of the City of New York. First, we will develop a resource inventory allocation and control. This data base would involve all equipment owned or leased by the City of New York which could be used during emergencies. For example, emergency generators, emergency lighting equipment, aircraft, wheeled vehicles, etc. The system would include the owners and locations of the equipment and be designed to prevent a multiple assignment of equipment or any given asset. Additionally, it would monitor the depth of reserve supplies and serve as an early warning of shortages. Moreover, it would provide us with an estimate of the cost of the equipment for the disaster.

During the recent blackout of August, it was necessary to manually determine where generators were located, manually track the generators to the emergency locations and

their subsequent return to their owners. A resource inventory system would ensure speedy and accurate allocation and recovery of resources.

The next application has to do with Terrorist Response Planning. Although terrorist activities are unpredictable, various pre-planned responses at the time of an incident may prevent futher damage or injury. For example, if a bombing occurs, it may be prudent to increase security and conduct bomb searches at key locations.

A real life example occurred on New Year's Eve of 1982 when the FALN struck governmental buildings in the City of New York. If we could work with intelligence personnel to develop a profile of different groups describing what their targets would be, we could upon receiving evidence that a bombing is planned or that a bomb has been laid down pre-allocate personnel to harden these targets. For example, if the FALN struck a government building, we could assign personnel to police headquarters, City Hall, Gracie Mansion (the Mayor's residence), Fire Communications, the Emergency Medical Dispatching Center, and possibly Con Edison's control center and the Nyack's AT&T switching center. A model can be developed to allow emergency planners to assign resource commitments consistent with the provision of various levels of protection to variable potential targets.

The next application has to do with Evacuation Planning. Resource plans can be developed and stored on a data base to understand the effect on resources of various evacuation scenarios. By understanding the effect on each evacuation area individually, the model could forecast workloads and resource loadings for various evacuation options that might be faced during an emergency. For example, it might be discovered that evacuation may have to be conducted in phases to coordinate with the lead time necessary to provide relocation centers and related logistical support (food, cots, medical teams, etc). The system would store the data and create response forecasts and scenarios as needed.

The next application is for our Emergency Plan Inventory and Coordination. Here records can be kept of various agencies and key governmental organizations' emergency plans. A data flow model would be developed to assure that the inputs that Agency A expects to recieve from Agency B are in fact called for as outputs of Agency B. This coordination is vital to insure that the plans of the individual agencies will integrate properly when an emergency occurs. This is extremely important for a city the size of New York, considering the amount of resources in the various agencies and the number of contingency plans we currently have in place.

A final very vital model which we are currently

working on is designed for Labor Disputes. New York City is subject to labor stoppages both by municipal employees and critical non-municipal workers. For example, this past summer we were struck both by Con Edison, which is our sole supplier of electricity in New York, and also by AT&T, which supplies us with our telephone service. This coming July 1st, all municipal contracts will have expired. Models can be developed to determine staffing patterns in struck agencies which the Office of Civil Preparedness would use to forecast the work to be assigned to various agencies in the event the stoppage materializes. The ability to see the effect of various changes in planning assumptions (so called "what-if" modeling) would be valuable not only for planning, but for creation of realistic scenarios. For example, if the Police Department, Fire Department, and Correction Department were to strike in July of 1984, how would the ECB provide protection in the streets of New York while insuring that correction facilities are run and that there are knowledgeable personnel able to respond to and extinguish fires.

In addition to these five applications which I have just outlined we are also working on an Incident Recording and Reporting Model, a Damage Assessment Data Model, a Special Skills Inventory Model, and a Support Simulation Model.

In conclusion, over the past 5 1/2 years, the City of New York has worked feverishly in designing, implementing, and testing a Command Structure to effectively manage emergencies. Meanwhile, it has developed a host of contingency plans which are continually reviewed and updated. Each year a crisis management audit of the City of New York is conducted to determine what the most likely disaster or crisis that could hit the City of New York is. Thereby, the probability and impact of emergencies is frequently assessed. We have now begun to move into a new age - that of computer technology. With our micro-computer systems, we will be able to increase or improve our ability a hundredfold in managing these emergencies which strike the City of New York.

Mr. GORE. Great. Very, very interesting and helpful, and we'll hold off on questions until the other witnesses have completed their statements.

I'd like to call next on Dino Brugioni, from Falls Church, Va. Welcome, and please proceed.

Mr. BRUGIONI. I've been in reconnaissance and photo interpretation work since 1941.[1]

Mr. GORE. Move that microphone a little bit closer, and lift it up slightly, if you could.

Mr. BRUGIONI. All right.

Mr. GORE. All right.

Mr. BRUGIONI. I've been in reconnaissance and photo interpretation work since 1941,[1] and I was one of the founders of the National Photographic Interpretation Center, and as you know, Mr. Chairman, that Center has contributed and continues to provide information vital to the national security of this Nation. It provides the information to the President, the Congress, and to the departments and agencies of the U.S. Government.

When we started in 1955 with the U-2, we recognized the value of aerial photography in its implications and how it could be used in civilian agencies, and Mr. Lundahl, the Director of the Center at that time, went to the Director of Central Intelligence and the President's Science Adviser and said, "This could be used by the civilian agencies so that they may be able to do their work much better."

In 1967, as a result of a formal study, the recommendations were approved and the Director of Central Intelligence engaged in agree-

[1] See change in appendix, p. 157.

ments with the civilian agencies to share that information technology.

Now, Mr. Lundahl, at that time, recommended that there be a "White Center," very similar to the National Photograghic Interpretation Center, but devoted to emergency management operations.

Now at that time, we were called upon frequently by the President, or by the President's Science Advisor, to take photographs over the continental United States and we did a number of projects related to natural disasters, hurricane, and tornado damage, and the Santa Barbara oil spill. We conducted route surveys for the Alaska pipeline. We conducted national forest inventories. We determined the extent of snow cover in the California Sierras to forecast runoff and we detected crop blights in the Midwestern States.

Now, the Rockefeller Commission reviewed what the agency had done and the participation with the civilian agencies, and it concluded,

> The Commission can find no impropriety in permitting civilian use of aerial photographic systems. The economy of operating a single aerial photographic program dictates the use of these photographs for appropriate civilian purposes.

I have no doubt, Mr. Chairman, that assessing, mitigating or preventing large-scale national disasters would certainly be considered "appropriate civilian purposes."

Now, I'm constrained, for security reasons, in discussing the classified overhead reconnaissance systems, but it's readily agreed by those familiar with the systems that, properly used, they could contribute materially to a better understanding of and a capability to better assess the damage from a natural or technological disaster.

Using the advanced technology, the capability to predict the magnitude of a disaster is within our grasp. With the capability to predict comes the incumbent responsibility to take preventive measures.

I want to emphasize again, as the others have, the acquistion, processing, storage, and retrieval of imagery-derived data has progressed in quantum leaps in recent years. Only those intimately engaged in the imagery field realize the immense breadth and unlimited capabilities inherent in these endeavors.

Although it may not be clearly defined to say the physical sciences are chemistry disciplines, its applications traverse nearly every field of artistic and scientific endeavor, from archeology to zoology.

Now, the future portends even greater opportunities because the imagery can now be digitized and the combining of imagery interpretation expertise with computer technology just opens up many new fields of endeavor.

We are already beginning to hear terms like change detection, computer-assisted, and automatic when applied to new photo interpretation, photogrammetric, and analytical techniques.

Now, the—wherein in the past, we were only concerned with targets or local areas, we are beginning to see imagery-derived data utilized in the preparation of technical reports that cover entire States, regions, and countries. The enormous volume of imagery-de-

rived data now under computer control has untold applications to analysts in the emergency operation centers.

Now, as they say back in my home State of Missouri, "Well, show me how this information can be used." On July 3, 1983, I authored an article for the *Washington Post* and the title of it was "Why Didn't the Feds Block the West's Floods?"

I maintained that the Government had the technology, methodology, data, and expertise to have largely prevented and most certainly acted more responsively to the massive flooding in the West caused by the snow melt of 1983.

The NASA photographs were clear, detailed, and encompassed the area—the entire area of snow melt concern. You could have called on the SR-71's. They could have flown that whole 1,450-mile length of the Colorado River in less than 45 minutes. The NASA U-2 aircraft are equipped with a variety of sensors; they could have been brought to bear.

The Geological Survey had—has excellent 1 to 24,000 scale maps of the entire area. They could have been used for snow melt measurement and analysis.

The Defense Mapping Agency, the U.S. Geological Survey and the CIA have excellent photogrammetric capabilities in which they could have measured the amount of snow in the mountains. That information could have been passed off to hydrologists and they could have estimated the amount of water that was going to come off of those mountains.

Within the Federal establishment, there already exists a computer capacity to process that kind of information so that when you know what's going to happen, you could have prepositioned equipment. The Defense Department could have been called on and could have prepositioned equipment in areas where there could have been flooding.

But more important than that, had they used the expertise of the people in the Tennessee Valley Authority and the California Water Authority, the dams and reservoirs could have been drawn down and the flooding could have been mitigated or prevented.

The work—the work of the California Water Authority on the western side of the mountain was shortly—well, it was spectacular. And, of course, the Tennessee Valley has expertise in this.

I have been in——

Mr. GORE. Enormous expertise.

Mr. BRUGIONI. Right. [Laughter.]

We know—I hate to mention this, sir, but I knew your daddy very well, and he——[Laughter.]

And he never let us forget in the Tennessee Valley Authority—I worked for the Tennessee Valley Authority for 3 years—he never let us forget that the Tennessee Valley Authority was built to prevent floods, and we'd better prevent floods.

Now, from my—the total damage of property, crops, recreational facilities, expenditures for cleanup activity, along with the damage done by the silting in dams and reservoirs, has been estimated to be $1 billion. Had you had a task force created here in Washington with the expertise—and again, I emphasize with the others—pick

out the appropriate people—about 30 people—at the cost of $5 million, you could have prevented all that damage.

Now, the—the people, the expertise, and the technology were already in place in Washington. In the affected agencies, if you had called on these experts, first thing, they're paid for. The equipment is here. The technology is here. Had you called upon them, the only thing that you would have done to those agencies, you might have—there might have been some routine projects that would have had to be pushed back.

Now, the question that comes up whenever you look at disasters such as this, the question that always comes up is, "Whose fault is it?" Well, the fault, I feel, lies in the Federal Executive and with the Congress that does not encourage, order or legislate such cooperation.

The position most frequently taken around Washington with respect to natural disaster is, "It's not in our charter. It's not in our budget," and so you can pass it off.

Now, in the intelligence community, there is a committee charged with establishing photo collection and exploitation priorities. There is no comparable organization concerned with civilian endeavors.

Now, Congress, I think, has been very generous in providing the intelligence, defense and civilian agencies with sophisticated photo-taking and imagery-recording devices. This ranges from the Enviropod that's carried by the Environmental Protection Agency that can be strapped on any light aircraft to the satellites. But in between, you have the mapping agencies, they have the capability; the military services, the U-2's, the TR-1's, the SR-71's and the satellites.

Now, there is another problem in the civilian agencies and that is that the interpretation of the imagery in the civilian sectors is not centralized as it is in the intelligence community, and therein lies a problem. Since there is no White Center, the interim solution to many of these problems, I feel, could be the task forcing. It seems strange to me that in matters affecting the national security outside the U.S. borders, task forces are regularly organized with experts from the various agencies detached from their duties, yet when it comes to domestic matters affecting a nation's socio-economic security, little or nothing is done.

There is no encouragement for this type of task force in the civilian sector, although the Senior Executive Service was created to do just that. I was in contact with them—and it's kind of a sad commentary, but last year, in 1982, out of a labor pool of 8,200 senior executives, only 120 were transferred to help out in other agencies. The year before, there was only 81.

I feel that Congress must really press this to have these organizations tie in their capabilities. I find it strange that in the intelligence community, we assess natural disasters abroad as a routine matter and we prepare recommendations to the President in the event that the affected nations ask for aid.

I find it strange that the space technology which enables the United States to accurately monitor and predict the crop yields of the Soviet Union, Australia, Canada, and India was not used in the draught in the Midwest this year.

I also can enumerate many other situations where you take the data from the Defense, the mapping community, the intelligence community and the meteorlogical data obtained from weather satellites that could be integrated to provide a better hurricane and major storm-warning system. The words that I detest most when hearing about natural disasters are "without warning." The capacity to mitigate and prevent disasters exists. The technology, the equipment and the methodology is here. We're simply not using them.

Although today there is some collaboration with people on the ground with the aerial collectors, if you look to the future, there will be sensors on the ground read by collectors in space.

We must create an ongoing mechanism that will enable us to monitor these key technological developments and bring them to bear on natural and technological disasters.

In conclusion, perhaps I can best encapsulate my summary with a quotation from John Naisbitt's *"Megatrends":*

> As a society, we've been moving from the old to the new and we are still in motion. Caught between eras, we experience turbulence. Yet, amid the sometimes painful and uncertain present, the restructuring of America proceeds unrelentingly.

Now, this bit about remote sensing, very few people really are familiar with it, but the American Society of Photogrammetry has done a tremendous task. They've recently published these two volumes, *"Manual on Remote Sensing,"* which discusses all of the various systems that I've just talked about and how they can be used.

Now, I do have——

Mr. GORE. And where are those volumes available?

Mr. BRUGIONI. These are available from the American Society of Photogrammetry and I suggest that anyone who is interested in remote sensing, by all means should purchase these.

Mr. GORE. And that's based in Washington, right?

Mr. BRUGIONI. Based in Falls Church, Va.

Mr. GORE. Falls Church.

Mr. BRUGIONI. Now, I do have some photographs—unfortunately, I can't show you any classified ones, but I can show you some of the photographs and how they can be used in natural and technological disasters.

Mr. GORE. Fine.

Mr. BRUGIONI. [Vu-Graph.] Could I have somebody flip for me here? Could I have somebody operate for me here? I have to point out data.

Mr. GORE. I think you've got a volunteer in the front row there.

Mr. BRUGIONI. Do I have a volunteer. Here's all this technology and we can't run a 35-milimeter projector. [Laughter.]

These are the photographs that I used to write the article in the Washington Post. Here you can see—this is near Salt Lake City and Ogden, Utah. Here you can see the snow in the mountains in May 1976. I think even a layman can see that there's much more snow in the mountains in 1983, but if you look close, you can see the snow—you can tell exactly where the snow is coming off of the mountain—the water's coming off of the mountain. You can see it going in the streams. You can see the flooding there.

Where the streams form, there was flooding. Where the streams became rivers and where the rivers met, there was flooding. In other words, it was almost a foregone conclusion that Grand Junction, Colorado was going to get it when you looked at these kinds of photographs.

Next slide, please. [Vu-Graph.]

This is a beautiful job that was done by NASA on Mount St. Helens. Here you see—this is satellite photography. Here you see Mount St. Helens before—next. [Vu-Graph.]

Mount St. Helens after. It doesn't mean too much when you look at a photograph like that, but when it's carefully analyzed, you could do the damage assessment very, very well. [Vu-Graph.]

This is some spectacular work, in my opinion. You can see here the caldera surface, the mud debris, the blowndown trees, the damaged trees, sparse vegetation, mature timber, water, turbid water and so forth. Beautiful piece of work.

This is what's needed before you move into the area to do the reclamation work. [Vu-Graph.]

I want to tell you about a little experience that I was involved with. When the—when the earthquake struck Italy, there was all kinds of confusion and the Italians asked for help. We flew a U-2 mission, as you can see here, in a typical search pattern. The film was rushed back to Washington. Next shot. [Vu-Graph.]

Within one night, we did a damage assessment survey to show the Italians exactly where the damage was located. We also gave them photographs of the areas of concern. [Vu-Graph.]

We showed the photographs of the villages that were the most severely damaged. [Vu-Graph.]

The same thing happened in 1976 in Guatemala a few years ago. There was a large earthquake and whenever you have an earthquake, the communications and transportation facilities go down, and so they asked us if we would fly a U-2 mission over the area. We did.

One of the amazing things about this particular mission is that we could see the fault line and we could follow it for about 150 miles and all we had to do was look on either side for the damage.

We also——[Vu-Graph.]

We also looked at the villages and we could pick out those that were heavily damaged and there were helicopters at Guatemala City with—with doctors and eight specialists standing by, but they didn't know where to go and we could direct them precisely to the areas that were the most heavily devastated. [Vu-Graph.]

We can look at the near IR spectrum—the near IR is a beautiful little vehicle that senses the chlorophyl in plants and so here you can see this particular area, we can sense it and we can say that it's good, you're going to get 55 bushels to the acre. This one is fair. You'll notice you go from lush growth which is red to poor growth which is pink. In this case, this area is going to yield 35 bushels an acre; this one is very poor, it's going to yield 20 bushels per acre. [Vu-Graph.]

I don't have to tell you anything about farming practices. This is a shot of the Imperial Valley. You can see the farming practices in the United States. This line on this side; that's Mexico. [Vu-Graph.]

Now, you can even go—if you wanted to take it to the extreme—in this particular case—this is an IR shot—and this fellow has got a very bad septic tank and it's leaking. You can see the lush growth right here. [Laughter.] [Vu-Graph.]

If you look at this photograph, this is a spill. It doesn't look like any great damage. This is the conventional color, yet when you used the near IR——

[Vu-Graph.]

Mr. BRUGIONI [continuing]. You can see that there's considerable damage done to the trees and if it's done to the trees, it's also done to the soil. [Vu-Graph.]

This is the far IR, or the—this is the heat-sensing sensor. Years ago, there was no such capability as you have here. This is the affluent from a powerplant. White is hot, black is cold in IR. In this particular case, years ago, you would get out in a rowboat and take the temperature of the water. Now you'll notice here that the temperature right here is 80 to 81 degrees. Down here, it's 65.

We were the first to indicate the danger of what we call the thermal blocking. In other words, had you had two powerplants, or had this plume gone clear across to the other side, fish, being cold-blooded animals, would not traverse that hot water and you could break down the whole ecological chain in a river. [Vu-Graph.]

The—again, the thermal IR you can tell which houses are well insulated. In this case, this contractor did a pretty good job—black is cold, white is hot. This one did a little better—I mean, a little poorer job; and this fellow right here, this contractor, as you can see, got away with murder. [Laughter.]

You can see all of the heat leaking from these houses. I showed this slide to one group and a guy said, "That's my house." [Laughter.] [Vu-Graph.]

We are the people that also found out that you could find water. In Hawaii—this happens to be Hilo—whenever it rains, the water disappears. No one knew what happened to it. We flew a mission in what we call a "serendipity effect." We started looking. We found these cold streaks of water coming off the land into the sea. We didn't know what we had until we put our heads together and found out that right underneath this beach, there's cold water—fresh cold water flowing to the sea. All you had to do was put a well there, a well here, a well here, and you'd have all the fresh water that you would need. [Vu-Graph.]

Another sensor that's very good is called SLAR, or side-looking radar, or synthetic apperature radar. The beauty about synthetic apperature radar, you can fly it in dust—and it will penetrate dust. It will penetrate clouds, and, of course, it'll penetrate darkness.

In this particular case, this happens to be a jungle area. As you can see, here's the river. You'll note on the map, there's no details because you can't penetrate the jungle cover. But the nice thing about SLAR is that it will penetrate jungle cover.

May I have the next slide, please? [Vu-Graph.]

Here you can see—look at the detail that you can get. There's the river. Look at the details of the mountains that's underneath that foliage. [Vu-Graph.]

We often talk about the serendipitious discoveries. We were working with the Navy and with Eastman Kodak far back and we

were trying to see how far we could penetrate water to see how—how deep we could sense a submarine. Well, if you have—you can go from 20 to 30 feet. In excellent conditions, you can penetrate the water to 50 feet. In essence, you're taking the green layer out of the film.

The Canadians heard about the film and said, "Hey, could we borrow some," and they came back and said that they had the best inventory of beluga whales that they ever had. [Laughter.]

What happens is that mother whale, when she gives birth to her young, she stays in about 15 feet of water; she keeps her young between herself and the coast, and so in this particular case, that's a perfect count of beluga whales.

One of the things—I've written several articles on this serendipity effect—is that many times we get things, say for intelligence, that have uses in the civilian sector. [Vu-Graph.]

Now, you've seen the cost of the SR-71, the U-2, and all of that. Here's the camera that's used by the Environmental Protection Agency. They're prepositioned in areas of the United States, can be carried, and they can be strapped on light aircraft and they get excellent photographic coverage.

Incidentally, if you have a small-scale disaster, this would be the vehicle that I would call on first, rather than getting a U-2 or an SR-71 cranked up.

If it's a large-scale disaster, of course, I would get those. [Vu-Graph.]

The first picture of Three Mile Island was taken with the Enviro Pod. There's a photograph of it. I think that's the last photograph that I have.

Mr. GORE. Does that conclude your testimony?

Mr. BRUGIONI. Yes, sir.

[The prepared statement of Mr. Brugioni follows:]

STATEMENT OF
DINO A. BRUGIONI
CONCERNING THE ROLE OF INFORMATION TECHNOLOGY IN EMERGENCY MANAGEMENT

Chairman Gore, Members of the Subcommittee:

I am very pleased and honored to be asked to testify before the Subcommittee concerning the role of information technology in emergency management. My testimony will emphasize the vital role that aerial photography and multi-sensor imagery can play in this critical endeavor. The views I present are my own based on professional credentials acquired through long experience.

I recently retired as a senior official of the Central Intelligence Agency culminating a career of over 40 years in reconnaissance and imagery interpretation activities. The expertise garnered during my long career began in World War II when I flew in 66 bombardment and a number of reconnaissance missions over North Africa and Europe. After the war, I worked for the Tennessee Valley Authority while attending George Washington University where I earned B. A. and M. A. degrees in Foreign Affairs. I joined the CIA in 1948 and, in 1955, became one of the founders of the multiservice National Photographic Interpretation Center which derives intelligence information from a variety of overhead reconnaissance systems. The Center, as you know Mr. Chairman, has contributed and continues to provide information vital to the national security of this nation to the Congress, the President, and the Executive Departments and Agencies of the U. S. Government.

The scientific and technological developments achieved as part of U. S. intelligence operations have numerous applications in the civilian sector. Mr. Arthur C. Lundahl, the Director of the National Photographic Interpretation Center from 1956 to 1973, recognized the value of this material early in our endeavors and discussed with the Director of Central Intelligence and the President's Science Adviser the value of sharing this data with civilian agencies. In 1967, as a result of a formal study recommending this sharing, the Director of Central Intelligence entered into agreements with a number of federal agencies permitting them access to classified overhead photography. Mr. Lundahl, at that time, recommended the creation of a "White Center" where pertinent aerial photography could be used for emergency management purposes and suggested that

the National Photographic Interpretation Center serve as an organizational model. Subsequently, the Center was directed by the President and/or the President's Science Adviser to exploit aerial photography acquired over the continental United States for such diverse projects as mapping, assessing natural disasters such as hurricane and tornado damage, the Santa Barbara oil spill, conducting route surveys for the Alaska pipeline, conducting national forest inventories, determining the extend of snow cover in the California Sierras to forecast runoff and the detection of crop blight in the Plains States. The Rockefeller Commission reviewed the concept of sharing data in 1975 and concluded: "The Commission can find no impropriety in permitting civilian use of aerial photographic systems. The economy of operating a single aerial photographic program dictates the use of these photographs for appropriate civilian purposes." I have no doubt, Mr. Chairman, that assessing, mitigating or preventing a large-scale national disaster would be considered "an appropriate civilian purpose."

I am constrained, for security reasons, in discussing classified overhead reconnaissance systems, but it is agreed by those familiar with the capabilities of both classified and unclassified reconnaissance systems that, properly used, they could contribute materially to the better understanding of, and a capability to better assess, the damage from a natural or technological disaster. Using this advanced technology, the capability to predict the magnitude of a given disaster is within our grasp. With the capability to predict, also comes the incumbent responsibility to take preventive measures.

The acquisition, processing, storage, and retrieval of imagery-derived data has progressed in quantum leaps in recent years. Only those intimately engaged in the imagery field realize the immense breadth and unlimited capabilities inherent in these endeavors. Although it may not be as clearly defined as say the physical science or chemistry disciplines, its applications traverse nearly every field of artistic and scientific endeavor from archeology to zoology.

The future portends even greater opportunities because imagery can now be digitized, and the combining of imagery interpretation expertise with computer technology, and

their interactions and manipulations, provide us with numerous innovative applications. We are already becoming familiar with terms like "change detection," "computer assisted," and "automatic" as applied to new photo interpretation, photogrammetric, and analytical techniques. Whereas in the past, photo interpretation studies might only be concerned with local areas or specific targets, we are beginning to see imagery-derived data utilized in the preparation of technical reports on entire states, regions, and countries. The enormous volume of imagery derived data now under computer control has untold applications by analysts in Emergency Operation Centers.

Unfortunately, the civilian sector lags far behind the intelligence community in the centralization of knowledge and application of imagery dervied information.

But, as they say back in my home state of Missouri,"Show Me" how this information can be used in a national disaster. On July 3, 1983, I authored an article published in the Washington Post entitled "Why Didn't the Feds Block the West's Floods." I maintained that the federal government had the technology, methodology, data, and expertise to have largely prevented, and most certainly to have acted more responsively to the massive flooding in the West caused by the snow melt in the spring of 1983. But for a variety of bureaucratic reasons the Federal Agencies involved chose not to do so.

The available NASA satellite photos were clear, detailed and encompassed the area of snow melt concern. Additional photographic data might have been provided by SR-71 aircraft missions which could have flown the 1,450-mile length of the Colorado River in less than 45 minutes. NASA U-2 aircraft, equipped with a variety of multi-sensors, could have provided additional vital data. These missions could have been flown as part of the routine pilot training program of these organizations, thereby incurring no additional expenditures in flying dedicated operations.

The U. S. Geological Survey had available maps of the areas of concern and of sufficient detail and the scale required for snow melt measurement and analysis.

The Defense Mapping Agency, the U. S. Geological Survey, and the CIA have excellent photogrammetric capabilities which could have been used to accurately measure and compute the amount of snow and the attendant water runoff that would accrue from such

snow pack. The lay of the snow in the mountains and the streams to which the water would flow could have easily been determined. With the flow computed, using the long-standing expertise of the Tennessee Valley Authority and the California Water Authority, dams and reservoirs could have been drawn down sufficiently to control flooding.

Within the federal establishment, there already exists the computer capacity to process and analyze the data required to accomplish this task.

The Defense Department had earth moving equipment, trucks, and buses which could have been prepositioned in the event of local flooding.

The total damage to property, crops, recreational facilities, expenditures for clean up activity, along with the damage caused by silting in dams and reservoirs has been estimated to be about a billion dollars. Incalculable was the loss of 156 lives. I find the loss of a single life, when it might have been prevented, unconscionable. The only warning many of these people had of danger was when the water and mud crashed through their homes.

In addition to the above, there was the cost to the federal government which had to provide low-cost disaster loans to the affected areas.

From my experience in reconnaissance and interpretation activities, had a federal task force been established and the work properly prioritized, warnings could have been given and most of the flooding and consequent damage could have been prevented. My estimate of the cost of implementing such a task force is only about 5 million dollars. This would include the establishment of a command center and the cost for transportation and communication of coordinated activities. The people, the expertise, and the technology were already in place in Washington. In the affected agencies, priorities could have been shifted from routine projects - few of which could compare in importance with the alleviation of suffering and damage to property and crops.

Regretably, no effort was made to combine the resources of these organizations. The logical question is "Whose fault is it?" The fault lies in the federal executive and with the Congress that does not encourage, order, or legislate such cooperation.

The position most frequently taken in Washington with respect to natural disasters is "It isn't in our charter." Another is "It's not in our budget."

Within the intelligence community there is a committee charged with establishing photo-collection and exploitation priorities. There is no comparable organization concerned with civilian endeavors. The civilian agencies have undertaken countless in-house and contracted studies, but have been derelict in translating recommendations into action. Rather, each civilian organization has gone its own way, often oblivious or unconcerned with what other agencies are doing.

Congress has been generous in providing the intelligence, Defense, and civilian agencies with sophisticated photo and image recording capabilities. Capabilities range from the Environmental Protection Agency's portable strap on cameras (pre-positioned in various U. S. locations and can be flown by most light aircraft) to the high technology equipment of mapping agencies and the military services, to the U-2, the TR-1, the SR-71 and the satellite platforms.

The interpretation of imagery in the civilian sector is not centralized as in the intelligence community and therein lie many problems. The interpretation process must also include a photogrammetric and image enhancement capability to enable performance of a wide variety of studies on the targeted areas.

Since no "White Center" exists, an interim solution would be the "task forcing" of such activities. It seems strange that in foreign matters affecting the national security, task forces are regularly organized with experts from various agencies detached from their regular duties and assigned to aid in the planning and execution of a particular mission. Yet, when it comes to domestic matters affecting the nation's socio-economic security, little or nothing is done. There is no encouragement for this type of task forcing in the civilian sector, although the Senior Executive Service was created to promote this type of cooperative endeavor. In recent communications with the Office of Personnel Management, I was informed that they heartily endorse the task force concept of detaching Senior Executive Service careerists to solve problems related to national disasters. However, the record of the federal government in those instances could stand some improvement. In 1982, there were 120 transfers out of a pool of over 8,200 available experts. In 1981 there were 84. Congress must abet the initiative, outreach, and

interaction of these organizations by requiring relevant testimony regarding this approach during appropriation hearings.

I find it strange that the intelligence community assesses natural disasters abroad as a routine matter and prepares recommendations to the President in the event the affected foreign nations ask for aid. There is no such routine procedure within the civilian sector.

I also find it strange that the advanced space age technology which enables the United States to accurately monitor and predict the crop yields of the Soviet Union, Australia, Canada, Argentina, and India was not used to measure the effect of the drought this summer on U. S. crop yields.

I can enumerate many other situations in which information possessed by the Defense Department, the mapping community, the intelligence community and the meterological date obtained from weather satellites could be integrated to provide a better hurricane and major storm warning system.

The words I detest most when reading about natural disasters are "without warning." The capacity to mitigate and prevent disasters exists. The technology, the equipment, the methodology and the expertise are there. We're not using them. Although today there is some collaboration among people on the ground and the aerial collectors, in the future, sensors on the ground will be read by the collectors in space. We must create an ongoing mechanism that will enable us to monitor key technological developments and bring proper pressure to bear on the responsible agencies to apply technological advances to the mitigation and prevention of technological and natural disasters.

Perhaps, I could best encapsulate my testimony with what I feel is a most pertinent quotation from John Naisbitt's Megatrends: "As a society, we have been moving from the old to the new. And we are still in motion. Caught between eras, we experience turbulence. Yet, amid the sometimes painful and uncertain present, the restructuring of America proceeds unrelentingly."

I would be happy to answer any questions you may have.

Mr. GORE. Thank you, that's fascinating.

Mr. BRUGIONI. I'll take any——

Mr. GORE. Pardon me?

Mr. BRUGIONI. I'll take any questions.

Mr. GORE. Great. Well, we'll have questions after our other two witnesses have completed their statements.

It seems to me that this is probably a good time for us to go over to vote before we get into the next statement. We will, with your indulgence, recess for about 7 or 8 minutes and go over for this vote and then we'll resume with you, Dr. Dobson.

[Recess.]

Mr. GORE. The subcommittee will come back to order. We have two final witnesses and it's my particular pleasure to introduce our next witness because he's a fellow Tennesseean, Dr. Jerome E. Dobson, now temporarily in Arizona. We're delighted to have you here and look forward to your testimony.

Mr. DOBSON. Thank you very much. The purpose of my statement is to expand upon and to explore an important point that was raised in the 1981 hearings. At the conclusion of a statement by William O. Baker, chairman emeritus of Bell Laboratories, you asked him to describe an ideal system for providing information to emergency managers, and I'd like to read his response. He said:

> It would look like a diagram of Three Mile Island, where the radiation levels, the wind conditions, the transport, the concentration of people and the rest of the environ were displayed in compartmented precise form so that simultaneously that information was available to the Administrator, the planner, ultimately the President.

Later that day, Maj. Gen. Bennett L. Lewis, Executive Deputy Director of FEMA, endorsed the goal and noted that FEMA was taking steps in that direction and mentioned that a similar system was being developed by Oak Ridge National Laboratory. We've heard others today endorse that kind of approach.

My comments will discuss the prospects for employing such a system at the national level.

The data listed by Mr. Baker all are geographical in that they vary considerably over space and they interact heavily with each other because of their locations. Their precise locations and aerial extents are crucial in determining levels of impact and options for response.

It was uncertainties regarding these geographical dimensions that caused most of the confusion at Three Mile Island.

The diagrams proposed by Mr. Baker are, in fact, computer-assisted maps comprised of millions of bits of information. This information can be shown visually as maps or entered into the most sophisticated of analytical models. All of the maps he listed can be produced using current technology and currently available national data bases.

To illustrate that the state of the art is ready to serve applications in emergency management, we prepared a demonstration which was presented to NRC and FEMA, as well as to the technical forum held here in 1981. The demonstration is posed as a hypothetical scene within an emergency operations center dealing with a nuclear-powerplant accident. We have arbitrarily chosen the Tennessee Valley Authority's Sequoyah nuclear powerplant, but the

same data are available for any point in the contiguous United States.

These data were obtained from various Government agencies and processed at ORNL. The hardware and software are suitable for geographical applications anywhere in the world.

I'd like to go to the viewer here. [Vu-Graph.]

The type of system that is needed to—the type of system that is needed to do the kind of analysis that's being referred to here is properly an automated, geographic analysis system. It's a comprehensive system, and what we have is a comprehensive system for addressing large, complex problems with high-spatial resolution and extensive aerial coverage.

Now, this requires highly flexible hardware and software dealing with a lot of different data sources, different map scales, different projections, different data grids, such as hydrologic boundaries, water—census boundaries and so forth—and a variety of aerial coverage. You want to be able to zoom in on a small area or do the entire Nation, as the case requires. It requires analytical modeling capability for simulation of events and for determining optimum responses.

The staff expertise that we have developed into it, the people component that's been referred to earlier today, is a group of geographers, computer scientists, economists, and a broad range of physical and social sciences working together. [Vu-Graph.]

Now, the hardware would require some pretty sophisticated equipment for entering data into the system. This is a digitizer tablet, a typical digitizer tablet, but the innovation here is that the data go into the computer and come out through the large box on the top. There is a video projector, so when it comes back on to the data, we can actually see—onto the tablet, we can see with the light beam what we're working with. In this case, we drew the boundary of Alabama and then moved it. We can change the scale, make it fit another map or whatever, edit it and that sort of operation. [Vu-Graph.]

We need a good set of image-processing equipment and data display equipment. [Vu-Graph.]

Both the CRT output and hard-copy output are essential in this type of working environment. Here's a device that's regularly used for producing glossy photos and here's another for producing high-quality color graphics, and I have an example here. [Vu-Graph.]

This particular map is population density for the entire United States and it can be produced in about an hour and a half, using that kind of technology equipment.

Now let me talk just a second about that population data. I've been told that one of the biggest problems at Mount St. Helens was getting population data even to have a very rough idea of how many people were in the affected area. You've all seen maps of population of this type, but the difference here is the amount of detail that lies behind this data.

Let's blow it up here. [Vu-Graph.]

Here's the northeastern seaboard. You can see New York, Philadelphia, Baltimore, Washington, Emmitsburg, all of the——

[Laughter.]

Mr. DOBSON [continuing]. Very tiny towns show up on it, too. That's the advantage of it. [Vu-Graph.]

Now, to give you a better idea of the amount of detail that's in that data base, this is the area of the Sequoyah nuclear powerplant. The center of the circle here represents the powerplant, 1 mile, 2 miles, 4 miles, 8 miles, and here the outskirts of Chattanooga, Tenn., working out to some fairly lowly—low population areas out here. Cleveland, Tenn., is over here, and that is available for any place in the Nation. We could have done that for the area of Mount St. Helens if we had known that they needed it and if they had known to come to us at the time. [Vu-Graph.]

Now, combining that with the satellite imagery, one of the points, I think, with Mr. Brugioni's presentation is that there's a tremendous amount that you can do with photographic information and remote-sensing information.

But one of the real keys that we have found is in being able to combine it with other kinds of data and really it's that integration that makes the difference in a case like the Colorado flood. [Vu-Graph.]

Now, taking—let's look at that population. This is the same area shown in the way that the emergency planning is done, calculating population at risk. Now, you can see how abstract this is compared to the earlier view of the same area. [Vu-Graph.]

Now, just as a demonstration, we adapted that to the—to the same system, and what we are able to do here now is to move this cursor along and automatically calculate the population for that sector and for the total. And this could be used with a—a radiation plume model to calculate either using the sectors or using the original polygons that I mentioned earlier—showed earlier. [Vu-Graph.]

Now, the nuclear powerplant accident is a case where we know what's—we know the location. We may not be able to predict when the event will occur, but we know where it will occur so we can make a lot of preprocessing of data and have a lot in hand. The more difficult problem is something like a transportation accident where we don't know where it's going to be, so let me just mention quickly some of the work we've done with transportation modeling and with hazardous—shipment of hazardous materials. [Vu-Graph.]

This system—we've got—I'm showing here the rail network. We have the highway network for all State and Federal highways and the—all airports and all barge terminals.

We can run this interactively with model—with routing models that help us determine the fastest way to get emergency services in or victims out. In the case of the Cosmo satellite, the—some of the emergency teams that go out to that sort of radiation cleanup are from Oak Ridge, and the geographic data systems staff were on alert, ready to run routing models if that had occurred anywhere to tell them what the fastest mode and route would be to get the services in. [Vu-Graph.]

Here is—taking that same data, subsetting it for a portion of the Southeast and running interactively a routing model using that video projector that I showed earlier so you can—you can—first, we asked the model to pick the normal route that a shipment of—in this case, spent nuclear fuel—would take going from South Caroli-

na to Louisiana and it picked this route. We then said: "If there were an embargo in Birmingham, what would be the next alternative?" and we drew this in and tested that. We then asked the model to pick another route that would be the optimum route and it shows one I'm not showing here, but one that goes along through here, and then automatically gives us a calculation of the distance, the number of companies involved, the time, and the population. [Vu-Graph.]

We can see that the optimum comes out better on all counts except the number of companies. Well, slightly worse on the hours.

Now, another aspect is terrain. This is the same area of the nuclear powerplant there with the tower shown here and it is a data base that's available for the entire United States. You can get it from USGS and it gives the elevation of every 1-acre cell in the United States.

Now most people would take a part of that and work with it. We have the—what we work with is the original DMA data that this came from and we have the entire set, 1,000 tapes, and you can access anyplace in the country that way. [Vu-Graph.]

Let me just mention briefly water resources. Some interesting things are happening right now. This is the level of detail that's available in just locating the streams, if you were working with a flood or something dealing with water resources. It's available for the entire United States, but it doesn't give you a lot of topological structure so that you can use it in a model.

When the EPA stream reach file is available to everyone, it will enable us to do very dynamic water modeling in a very easy fashion.

This demonstration shows that the heart of the system proposed by Mr. Baker is reality of today, rather than a dream of tomorrow. All of these capabilities have been developed with Federal funds, beginning with a sizable grant from the National Science Foundation.

The ORNL system has been used routinely in a variety of applications for DOE and other Federal agencies. Collectively, these applications have invested more than $10 million in the development of the system, and the emergency management community could reap the benefits without repeating the basic development costs.

Having established that the capability exists in one place, we should now consider how a similar capability would be installed as an integral part of emergency management networks extending throughout the entire Nation.

First, we have to draw a clear distinction between the type of universal system needed for this network and the fragmented systems being used for most applications today. The ORNL system is universal in that the data, hardware and software allow equal access to all areas of the United States, and they allow integration of all types of geographical data.

Unquestionably, a national network must employ common software, compatible hardware, and continuous data bases throughout the entire Nation. In contrast, many commercial systems available today will permit processing of geographical information for an individual power plant with data acquired in an ad hoc manner and repeated plant-by-plant.

Following this procedure, the time and cost for covering all nuclear plants would be excessive and the results would not apply to other locations susceptible to other types of hazards. A universal system is expensive to develop initially, but once in place, it can serve all locations and all hazards equally well.

The incremental cost of each work station, added to the universal network, would consist primarily of hardware costs, which tend to be small compared to the total cost of operating a geographical information system. A major theme in recent discussions has been the goal of integrated management of natural hazards, technological hazards, and warfare.

This approach will automatically require integrated management information systems for planning and response. The first step is to identify a common set of information needs for emergency operation centers, policymakers and planners.

Regardless of what type of hazard is faced, emergency managers almost always need to know: No. 1, where're the people; No. 2, where're the natural features that help or hinder response; what transportation options are available to get the victims out and emergency services in? What are the environmental pathways that are likely to spread the impacts to other areas? Where do the jurisdictional boundaries lie?

The data to answer all of these questions in a precise geographical form are available nationwide from various Federal agencies, but they are scattered over these agencies with no single repository. These data should be preprocessed and housed in a central repository in emergency operations center at FEMA, where they can be assessed by all emergency—can be assessed by all emergency management agencies.

This implies a large computer processing facility with graphic geographic and high-speed data transmission capabilities. FEMA's Emergency Information and Coordination Center is the obvious core of this function.

The framework should include distributed information systems established at regional offices, State emergency management agencies, and local emergency operations. These information systems should be integrated vertically from FEMA to the smallest local entity and horizontally area-to-area at each level.

In the case of the nuclear power plant accident, I would envision the utility, the State, the Nuclear Regulatory Commission and FEMA all having maps similar to those displayed earlier, plus analytical models to estimate key parameters.

With this automated system, it would be possible to precalculate a series of miniscenarios representing the possible range of values for size of release, duration of release, wind direction, and wind speed. When an accident occurs, the actual monitored data can be entered and the program can automatically call up the scenario that most closely matches the input data. After the initial response, operators will have time to run more extensive models that continuously accept monitored data and assess the probability of various levels of impact for precise locations.

In the case of a transportation accident and toxic chemical spill, operators could pinpoint the location of the accident on a three-dimensional terrain model that would allow them to trace the likely

flow of a liquid chemical downhill and downstream. Similarly, a gaseous chemical could be traced by entering the wind conditions into an air diffusion model. Population at risk would be calculated and evacuations recommended much the same as in the nuclear powerplant case.

Subsurface flow and contamination of aquifers also could be predicted if data were available, but the ground water hydrology has very sparse data coverage for most of the Nation.

The primary effect of this system would be to—would not be to supplant human intelligence and decisionmaking, but rather, to speed up many calculations and judgments that are already being made in emergency situations. The greatest advantage would be a better understanding of where the impacts can be expected to occur.

Furthermore, this understanding would be shared through a common set of information among planners and decisionmakers at all levels of authority. It is technically feasible to establish such an automated geographic analysis system for the United States. Considerable progress has been made and a schedule could be accelerated if current efforts were complemented by national commitment toward that goal.

Thank you.

[The prepared statement of Mr. Dobson follows:]

EMERGENCY MANAGEMENT INFORMATION AND TECHNOLOGY

HEARINGS

BEFORE THE

SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT

COMMITTEE ON SCIENCE AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

NOVEMBER 16, 1983

STATEMENT OF DR. JEROME E. DOBSON

OAK RIDGE NATIONAL LABORATORY

The purpose of this statement is to expand upon and explore an important point that was raised in the hearings on Emergency Management Information and Technology held by this subcommittee in September 1981. At the conclusion of a statement by William O. Baker, Chairman Emeritus of Bell Laboratories, Mr. Gore asked him to describe an ideal system for providing information to emergency managers. Mr. Baker responded, "It would look like a diagram of Three Mile Island, where the radiation levels, the wind conditions, the transport, the concentration of people, and the rest of the environ, were displayed in compartmented precise form so that simultaneously that information was available to the Administrator, the planner, ultimately the President." Later that day Major General Bennett L. Lewis, Executive Deputy Director of the Federal Emergency Management Agency (FEMA), endorsed the goal, noted that FEMA was taking steps in this direction, and mentioned that a similar system

was being developed by Oak Ridge National Laboratory (ORNL). My comments will discuss the prospects for employing such a system at the national level.

The data listed by Mr. Baker all are geographical in that they vary condiderably over space and they interact heavily with each other because of their locations. Their precise locations and areal extents are crucial elements in determining levels of impact and options for response by emergency managers. It was uncertainties regarding these geographical dimensions that caused most of the confusion at Three Mile Island. The remedy is not simple because geographical information is far more complex than other forms of tabular data. Consider, for instance, that the amount of data must automatically be multiplied by the number of data points used to represent the earth's surface. Additional data are required to locate each point in a spatial coordinate system. The popularity of maps as a means of conveying geographical information derives from the fact that the human brain can visually assimilate these huge volumes of data more easily than it can comprehend the columns of numbers that each image represents. The "diagrams" proposed by Mr. Baker are, in fact, computer-assisted maps comprised of millions of bits of information. This information can be shown visually as maps or entered into the most sophisticated of analytical models. All of the maps he listed can be produced using current technology and currently available national data bases. Advances in communications technology have vastly improved the speed with which data can be transmitted, but the rate of transmission may require several minutes

to reproduce each new map at a remote installation. The process could be accelerated by keeping most key maps resident in duplicate form on both the sending and the receiving systems.

To illustrate that the state-of-the-art is ready to serve applications in emergency management we prepared a demonstration which was presented to NRC and FEMA as well as to the technical forum held here in 1981. Please keep in mind that the geographical data bases, hardware, and software in the demonstration resulted from research conducted for Federal agencies in a variety of areas not necessarily related to emergency management. The system could be tailored more precisely to the needs of emergency managers if specific funding were available for that purpose. The demonstration is posed as a hypothetical scene within an emergency operations center dealing with a nuclear power plant accident. We have arbitrarily chosen the Tennessee Valley Authority's Sequoyah Nuclear Power Plant, but the same data are available for any other point in the contiguous United States. These data were obtained from various government agencies and processed at ORNL. The hardware and software are suitable for geographical applications anywhere in the world.

The first map shows the site in the schematic form that is normally used today for assessing population at risk. Sectors are defined in this way because, with traditional manual techniques, it is easy to count the population in each sector and enter the sum into equations that account for the distance from the plant. Map 2 shows the same area with a much more realistic representation of the population distribution derived from the Census Bureau's Enumeration

District data. The original data base contains one data point for approximately each thousand persons in the United States. It has been interpolated to show population density for the entire area. Overlaying this map with land cover derived from satellite data (Map 3), we see a very realistic image of the concentration of population relative to the contaminant source and other landscape features. Simultaneously we have added rail and highway routes to assess the transportation options available for evacuating residents and delivering emergency services. We could easily have shown additional information such as the location of county boundaries and other jurisdictional boundaries.

The actual distribution of the radioactive plume will be determined by the size of the release, duration of the release, wind direction, wind speed, and terrain. Numerous air diffusion models are available to estimate this plume. We have several models at ORNL but have not as yet incorporated one into this particular geographic information system. The cost would not be excessive, but so far no funding has been available. To illustrate the potential, we have displayed the wind rose and terrain for the area surrounding the Sequoyah Plant (Maps 4 and 5). The terrain data are available for every one-acre cell in the contiguous United States. The interactive nature of the programs allows us to move a cursor across the map and automatically count the number of people that would be affected by the radioactive plume in each sector and the cumulative total for all affected sectors (Map 6). The cursor is indicated by the small cross southwest of the plant, and the population counts are displayed at

29-457 O—84——6

the bottom. Here we have shown the traditional sector map adapted to the geographical information system. With this automated system, it would have been easier to intersect the actual polygon of the radioactive plume with the actual polygon of the population. The result would have been a more accurate estimate of the population at risk.

This demonstration shows that the heart of the system proposed by Mr. Baker is a reality of today rather than a dream of tomorrow. All of these capabilities have been developed with Federal funds beginning with a sizable grant from the National Science Foundation. To name a few examples of nationwide applications, this system has been employed to assess environmental and resource constraints to the National Energy Plan for DOE and the Office of the President, to assist in the Second National Assessment for the Water Resources Council, and to evaluate the effect of proposed changes in population criteria for the Nuclear Regulatory Commission. We assisted DOE and the Department of the Interior in calculating coal production goals before they were abandoned by the current administration. When there was concern over the danger of nuclear contamination from the recent descent of a Soviet satellite, Geographic Data Systems staff at ORNL were placed on alert to run the transportation routing programs and guide emergency teams by fastest mode and route to the affected areas if the satellite had fallen anywhere in the United States. Collectively these past applications have invested more than $10 million in the development of the system, and the emergency management community could reap the benefits without repeating the

basic development costs.

Having established that the capability exists in one place, we should now consider how a similar capability could be inst..led as an integral feature of emergency management networks extending throughout the entire nation. First we should draw a clear distinction between the type of universal system needed for this network and the fragmented systems being used for most applications today. The ORNL system is universal in that the data, hardware, and software allow equal access to all areas of the United States. Unquestionably a national network must employ common software, compatible hardware, ahnd continuous data bases throughout the entire nation. Many commercial systems available today will permit processing of geographical information for an individual power plant with data acquired in an ad hoc manner and repeated plant by plant. Following this procedure, the time and cost for covering all nuclear plants would be excessive and the results would not apply to other locations susceptible to other types of hazards. In contrast, a universal system is expensive to develop, but once in place it can serve all locations and all hazards equally well. The incremental cost of each work station added to the universal network would consist primarily of hardware costs which tend to be small compared to the total cost of operating a geographical information system.

A major theme in recent discussions has been the goal of integrated management of natural hazards, technological hazards, and warfare. This approach will automatically require integrated management systems for planning and response. The first step is to

identify a common set of information needs for emergency operations centers, policy makers, and planners. Regardless what type of hazard is faced, emergency managers almost always need to know:

1. Where are the people?
2. Where are the natural features that help or hinder response?
3. Where are the institutions and human-made structures that help or hinder response?
4. What transportation options are available to get the victims out and emergency services in?
5. What are the environmental pathways that are likely to spread the impacts to other areas?
6. Where do the jurisdictional boundaries lie?

It is therefore essential to have, at a minimum, the following geographical information:

1. Population distribution and density
2. Terrain
3. Land use highlighting critical facilities and installations such as hospitals, hazardous industries, and law enforcement agencies
4. Highways, railroads, waterways, and airports
5. Meteorological and hydrological data
6. State, county, and other political boundaries.

All of these data are available nationwide from various Federal agencies, but they are scattered over these agencies with no single repository. They have been collected for many different purposes, and their form often is not initially suitable for the applications

at hand. Considerable editing is required because error rates of greater than ten per cent are not uncommon. For example, one often finds counties erroneously located in the sea or in the wrong state. The greatest technical difficulty is in dealing with the diversity of data grids used by Federal and state agencies. Economic data are by state, county, and Bureau of Economic Analysis areas; population data exist in a variety of Census Bureau districts; water data are by natural hydrologic boundaries or aggregations of counties that approximate natural boundaries; land cover and terrain are by one-acre pixels; meteorological data are available only for specific points where weather stations exist; transportation routes and stream courses are portrayed as points and lines unrelated to bounded polygons. Add to this the inherent problem of acquiring data from a plethora of map scales and map projections, and it quickly becomes evident that preprocessing is essential if these data are to be ready when the disaster occurs.

Regardless where the preprocessing occurs, there should be a central repository and emergency operations center at FEMA which could be accessed by all emergency management agencies. This implies a large computer processing facility with graphic, geographic, and high speed data transmission capabilities. The Emergency Information and Coordination Center is the obvious core of this function, but additional investment will be required to build the kind of universal system that Mr. Baker and I have described.

The framework should include distributed information systems

established at regional offices, state emergency management agencies, and local emergency operations. These information systems should be integrated vertically from FEMA to the smallest local entity and horizontally area to area at each level. In practice the most sophisticated computer operations could be handled at the national level and the resulting capabilities made available to all other participants. It would be incumbent on FEMA to make these capabilities so attractive and user friendly that most, if not all, of the states and local agencies would participate voluntarily. State and local participation could range anywhere from operating a stand-alone system to exchanging geographical summaries through voice communication and hard copy correspondence with FEMA.

The security of the system would derive from the redundancies that are necessary to insure this type of integration. At the national level there would be a need for two or more compatible facilities to improve survivability of the system. The most efficient arrangement would be to establish a center outside of Washington that would serve as FEMA's technical arm and backup. A third center might develop under separate funding to meet the demands for this geographical analysis capability that will undoubtedly develop among non-emergency users. One or more of these should contain a training program for operators at all other facilities.

The information systems at the regional levels, which would include FEMA regional offices and perhaps other multistate agencies such as the Tennessee Valley Authority, could be smaller than those

at the national centers. They would be offered subsets of the national data bases to cover their respective regions and canned programs to estimate air diffusion, water transport of contaminants, population at risk, evacuation routing, and other key elements of emergency management. Redundancy and horizontal integration could be attained by providing duplicative overlap among the data bases provided to adjacent regions. Since the software would be identical, it would be possible for each regional office to back up its neighbors during an emergency and provide results as voice or data over whatever communications links remained operative.

A similar step-down in data base and computer size could be established in the states and local areas. Again canned programs could be offered to meet the most likely needs of these agencies, and redundancy and integration would be attained through overlap.

The national data bases provide essential information, but they are not sufficient to meet all of the needs at each succeeding level. Wherever there are requirements for special information or for more detail, each organization can augment its data bases and analytical capabilities according to its ability. Technical assistance should be available from higher levels and software provided to facilitate data entry.

This system can work in a variety of ways to improve emergency management and response. In the planning phase estimates of population at risk and preselection of evacuation and other response

measures could be greatly improved in accuracy and in the detail and variety of scenarios assessed. When disaster strikes, the system can provide identical sets of information to all levels of authority and can help in coordinating activity among parallel organizations and jurisdictions.

In the case of the nuclear power plant accident I would envision the utility, the state, the Nuclear Regulatory Commission, and FEMA all having maps similar to those displayed earlier plus analytical models to estimate key parameters. With this automated system it would be possible to precalculate a series of tens or even hundreds of scenarios representing the possible range of values for size of release, duration of release, wind direction, and wind speed. When an accident occurs, the actual monitored data can be entered, and the program can automatically call up the scenario that most closely matches the input data. After the initial response, operators will have time to run more extensive models that continuously accept monitored data and assess the probability of various levels of impact for precise locations.

In the case of a flood the National Weather Service forecasts could be entered into the system at FEMA headquarters and passed on to all affected areas. The forecasted precipitation levels could be entered into programs that would automatically estimate stream flows and contours of areas at risk.

In the case of a transportation accident and toxic chemical

spill operators could pinpoint the location of the accident on a three dimensionsal terrain model that would allow them to trace the likely flow of a liquid chemical down hill and downstream. Similarly a gaseous chemical could be traced by entering the wind conditions into an air difusion model. Population at risk would be calculated and evacuations recommended much the same as in the nuclear power plant accident. Subsurface flow and contamination of aquifers also could be predicted if data were available, but the groundwater hydrology has very sparce data coverage for most of the nation.

The primary effect of this system would not be to supplant human intelligence and decision-making, but rather to speed up many calculations and judgments that are already being made in emergency situations. The greatest advantage would be a better understanding of where the impacts can be expected to occur. Furthermore, this understanding would be shared through a common set of information among planners and decision-makers at all levels of authority.

It is technically feasible to establish such an automated geographic analysis system for the United States. Considerable progress has been made, and the schedule could be accelerated by, perhaps, a decade if current efforts were complemented by a national commitment toward that goal. The following actions are necessary:

1. The Federal government should create a single national repository for all digital geographic and cartographic information.

2. Research and development funds should be made available specifically to improve the analytical functions of automated

geography in addition to current funds which are primarily focused on improving the display functions of remote sensing and computer cartography.

3. The Federal government should give high priority to the development of a single universal system for the entire nation. Current efforts are fragmented among scores of systems designed to handle small areas in an ad hoc manner.

4. Research and development should be conducted to improve the system integration of all the computer-assisted tools of automated geography including computer cartography, computer graphics, digital remote sensing, quantitative spatial modeling, spatial statistics, and geographic information systems.

5. Research and development should be conducted to improve the design and operation of a network of geographic information and analysis systems at remote work stations.

6. Government efforts should be directed toward the improvement of several key geographical data bases especially those which emerge as crucial elements in geographical analysis for emergency management.

Mr. GORE. Thank you very much for an excellent statement. We'll hold off on questions.

Our final witness is Robert Wilkerson, director of the division of public safety, planning, and assistance in Florida, located in Tallahassee, Fla. Welcome and please proceed.

Mr. WILKERSON. Thank you, Mr. Chairman. I apologize for not being from Tennessee, but my assistant is, so——[Laughter.]

Mr. GORE. We'll overlook it.

Mr. WILKERSON. He had a lot to do with this speech so we'll be all right.

I appreciate the opportunity to testify before you on behalf of Florida and the emergency management profession. Many of those who have shared this opportunity this morning, and will in the next 2 days, are in their own rights scientists and researchers. I, on the other hand, am a practitioner.

It is likely, therefore, that my testimony will advocate a much more basic approach to the role of science and technology. That testimony is not given in opposition to worthwhile research and development activities that others might advocate. Rather, my hope is to discuss with you a proposal for parity between the development of new techniques and capabilities and their application in an activity that cries for enhanced capabilities that only science and technology can provide.

The members of this committee are intimately familiar with science and technology. Emergencies and emergency management, on the other hand, may well be shrouded with mystique. I think we've covered that this morning.

Viewed from a practical standpoint, emergencies lack even a common definition. One might well retreat to phrases such as those events that pose a severe threat to health, safety, and welfare of the population.

However, elected officials and administrators are faced daily with State and local—at the State and local levels with situations that threaten health, safety, and welfare, using simply emergency medical services, fire departments, and police departments within the realm of those departments' daily activities. Therefore, a rational definition of "emergency" for our purposes must consider the scale and the scope of the event and the absence of some dedicated organization to respond to such an event.

Florida has for some time defined an emergency from the State perspective as an event which poses serious threat to health, safety, and welfare of the State's population and for which dedicated programs do not provide a routine response capability.

Further, a hazardous event should be classified as an emergency if its scope or scale are beyond the capabilities of an affected local jurisdiction or require extraordinary coordination between an affected local jurisdiction, similar to the situation my colleague from New York pointed out this morning.

Thus, an emergency is more practically defined as a task for government than an abstract environmental or technological occurrence is created. After all, the significance of a hazard is the degree to which it makes people and property vulnerable, not the initial event itself.

Given such a broad definition of an emergency, who, then, is an emergency manager? Who do we want to provide the technology to? Emergency management is not some isolated specialty practiced by people with special insight from the basements of the county courthouses across the Nation. It is in every practical sense a valid component of public administration.

After all, emergency management is little more than an acceleration and intensification of the activities of government and private agencies in response to a particular contingency. Thus, my profession, emergency management, is simply an application of management to hazardous contingencies that may confront government and private agencies.

Who are emergency managers? Emergency managers are simply that; managers and administrators in large numbers scattered throughout government and many private agencies.

The impreciseness of this question does not stop at this point. The very array of scientific disciplines participating in this analysis demonstrates a range from the behavioral to the nuclear in focus and from the relatively abstract concerns of greenhouse effect impacts to the pragmatic daily difficulties of hazardous waste disposal.

Similarly, the technologies can cover a spectrum from simple office automation to sophisticated satellite systems for geophysical monitoring.

It might be helpful to pause for a moment and reconsider the points we have established concerning emergency management in the sciences. First, emergency management covers a broad spectrum of activities by numerous managers. Rather than a special field or profession, emergency management is the application of management capabilities and management science, if you will, to emergency situations.

Second, the scope of emergency management is such that there is no single or even select group of sciences that belong to the field. It is often useful to consider issues such as this from a case study perspective. Since I have advocated that we not limit our definitions to catastrophic events, I would like to use a case which represented a minimal emergency, even by my liberal criteria.

The "no-name" storm of 1982 provides an excellent case study of a manageable minimal emergency whose most disasterous impacts were the noticeable absence of essential science and technology. At least one responding agency has titled the "no-name" storm as a training opportunity. It offers many lessons for us, even after almost 18 months.

As a subtropical storm, the "no-name" storm was of little interest to the National Hurricane Center. Although they followed the weather system, the information provided was largely as a courtesy. But what if the storm had intensified? Although there may be many arguments surrounding the scientific progress of hurricane forecasting, the reality is that the forecast represents critical decisionmaking input for State and local emergency managers. Yet, despite tremendous improvements in communications technology, emergency managers are forced to base their decisions on information that is inferior to that available to local TV meteorologists.

The science, track and storm impact forecasting is available, but the technology that would allow use of that essential scientific input was not available. In this case, the hurricane technology gap is but conjecture. Surely in a subtropical event, the local meteorologist as part of the National Weather Service has at least a better linkage to local decisionmakers than we experience at the State and national level.

Only if the decisionmaker goes to the meteorologist. Only the phone and possibly the weather teletype link the two. Generally, local emergency managers have not developed a phased approached to decisionmaking that bases decisions on gradually improving scientific imput, but that's just as well since the input is not reasonably available.

The scientific and technological tools that would have allowed the application of event and impact forecasting to emergency management of the "no-name" storm were not science fiction. They simply went unused or unapplied.

Despite mammoth investments by government and private enterprise to develop such tools, much of their productive potential remains wasted. If one were to assume that the initial investment was unimportant, there remains a tremendous loss of property and life to which existing scientific tools are not being fully applied.

The southwest Florida area, which the "no-name" storm affected, has been the center of recent State and Federal attempts to improve decisionmaking through the application of science and technology. As part of this effort, meteorological forecasting and impact models have been combined with transportation modeling and social response research to provide a dynamic tool to assist emergency managers.

These tools provide emergency managers with a phased approach to emergency decisions, as opposed to the all-or-nothing criteria usually applied to emergencies. Despite these major benefits, these studies have highlighted the regional character of such events and conditioned local and State authorities to a process based on informed and coordinated decisions.

During this particular event, we were able to provide minimal information flow through hand computations and commercial phone lines. Participants recognized that such a limited capability to apply science was barely acceptable, even in a subtropical storm, and it would have been totally inadequate in a major event.

Again, the "no-name" storm demonstrates an emergency management system that often finds itself unable to apply useful scientific tools, not because appropriate technology does not exist, but because it simply has not been provided.

It must be noted that had the storm occurred in another area of the State, we would have been similarly unable to apply even the scientific tools. As the storm approached the coast, alert and warning procedures were implemented. With the exception of television, these procedures and the capabilities they reflect have remained unchanged since the 1920's. Even the advantages of television are increasingly neutralized as cable and satellite systems encourage the resident to review—to view remote stations that are either unconcerned with the particular event, or may be reporting informa-

tion related to the location of the station, rather than that which is pertinent to the viewer's area.

The southwest Florida area which the storm struck is the location of some of the State's most beautiful and expensive coastal developments. That's a chamber of commerce plug. [Laughter.]

The taxes for these properties are established by computer modifications—or by computer. Modifications are monitored by aerial, and in some cases, satellite telemetry. Rush hour traffic in several of the urban areas is controlled by computer.

Despite all this science and technology, the flood gage that would have warned residents to take protective actions along the Peace River, required onsite reading. Property values available in tax records had to be collected from each individual property owner as damage was assessed, and recovery operations were controlled and documented, using only the basic of administrative resources.

One might argue that despite all this—these shortfallings in the use of science and technology, affected local governments and individuals received the necessary assistance, and that certainly would be true. One might even argue that in such a small-scale event that local governments, if not the individuals themselves, should have been able to cope with such a minor emergency.

However, for the purposes of our consideration today, there are far more relevant points. Without question, the most basic of administrative automation systems would have paid for itself in the savings on this single emergency.

Certainly a remote sensing device on flood gages along the Peace River would have allowed the movement of sufficient furniture, later covered by disaster assistance claims, to offset several years' worth of monitoring costs.

My intent over the last several minutes was to use the no-name storm as a case study in the basic opportunities for the application of science and technology to emergency management. If a relatively insignificant event, such as a subtropical storm, offers such an opportunity, I hope that you can imagine the demand that is created by true disasters that occur daily in our fragile marriage of man and his environment.

I hope, also, that the case study has demonstrated the immediate and cost-effective opportunity to apply scientific tools and technology that we have all but taken for granted in other fields. Almost without exception, we can triple or quadruple the efficiency and the effectiveness of emergency management by applying the technology that I am sure is available in your own office; by using many of the same analytical tools already applied to urban and transportation systems; and by designing our emergency products and public information, utilizing the research and marketing techniques commonly applied to cereal products.

Over the last several years, Florida has experienced both frequent and widely varying emergencies, ranging from the no-name storm to the Mariel boatlift. Our experience has demonstrated to us a tremendous opportunity to improve public safety through enhanced emergency management opportunity.

The application of rudimentary scientific tools to our hurricane evacuation planning effort has moved the State to the international forefront in multijurisdictional evacuation planning efforts.

Similar opportunities are possible throughout the emergency management field. Florida, in considering its annual losses, finds that it literally cannot afford not to either provide additional resources to allow better utilization of science and technology, or as a bare minimum, to reallocate the available resources to the same end.

I would suggest to you that as a first phase of a policy to improve the application of science and technology to emergency management, we must assure that the most basic of tools and techniques available are applied to this critical service area.

We often measure the need for improved technology based on the day-to-day budget of an activity. In this case, science and technology offer the best available loss reduction opportunity, reduction of the fiscal and physical losses incurred in each emergency, and reduction of the waste and inefficiency in our response to these emergencies.

Consider, if you will, that in many of the urban areas in this country, that if you receive a traffic citation, it's generated by a remote computer terminal located in the police vehicle, while on a day-to-day basis, State and local governments, and many Federal agencies, are asked to manage events such as Mount St. Helens and a hurricane on a legal pad.

Thank you.

[The prepared statement of Mr. Wilkerson follows:]

PREPARED STATEMENT OF ROBERT S. WILKERSON, DIRECTOR, DIVISION OF PUBLIC SAFETY PLANNING AND ASSISTANCE, DEPARTMENT OF COMMUNITY AFFAIRS, TALLAHASSEE, FLA.

I appreciate the opportunity of testifying before you on behalf of Florida and the emergency management profession. Many of those who will share this opportunity with me are in their own right scientists and researchers, I, on the other hand, am a practitioner. It is likely that my testimony will advocate a much more basic approach to the role of science and technology. That testimony is not given in opposition to the worthwhile research and development activities that others might advocate. Rather my hope is to discuss with you a proposal for parity between the development of new techniques and capabilities and their application in an activity that cries for the enhanced capabilities that only science and technology can provide.

The members of this committee are intimately familiar with science and technology. Emergencies and emergency management may well be shrouded in mystique. Viewed from a practical standpoint, emergencies lack a common definition. One might retreat to phrases such as, those events that pose a severe threat to the health safety and welfare of the population. However, elected officials and administrators are faced daily at the state and local levels with situations that threaten health, safety, and welfare using emergency medical services and fire departments within their realm of their daily activities. Therefore a rational definition of emergency for our purposes must consider the scale and scope of the event and the absence of some dedicated organization to respond to such an event. Florida has for some time defined an emergency from the state perspective as an event which poses serious threat to health safety and

welfare of the state's population and for which dedicated programs do not provide a routine response capability. Further a hazardous event should be classified as an emergency if its scope or scale are beyond the capabilities of an affected local jurisdiction or require extraordinary coordination between affected local jurisdictions. Thus, an emergency is more practically defined as a task for government than an abstract environmental or technological occurrence. After all the significance of a hazard is the degree to which it makes people and property vulnerable.

Given such a broad definition of an emergency, who then is an emergency manager? Emergency management is not some isolated specialty practiced by people with special insight from the basements of the county courthouses across the nation. It is in every practical sense a valid component of public administration. After all, emergency management is little more than an acceleration and intensification of the activities of government and private agencies and response to a particular contingency. Thus, my profession, emergency management, is simply an application of management to hazardous contingencies that may confront government and private agencies. Who are emergency managers? Emergency managers are simply that, managers and administrators in large numbers scattered throughout government and many private agencies.

The impreciseness of this question does not stop at this point.

29-457 O—84——7

The very array of scientific disciplines participating in this analysis demonstrates a range from the behavioral to the nuclear in focus and from the relatively abstract concerns of greenhouse effect impacts to the pragmatic daily difficulties of hazardous waste disposal. Similarly the technologies cover a spectrum from simple office automation to sophisticated satellite systems for geophysical monitoring.

It might be helpful to pause for a moment and reconsider the points we have established concerning emergency management and the sciences. First, emergency management covers a broad range of activities by numerous managers. Rather than a special field or profession, emergency management is the application of management capabilities and science if you will to emergency situations. Secondly, the scope of emergency management is such that there is no single or even select group of sciences that "belong" to the field.

It is often useful to consider issues such as this from a case study perspective. Since I have advocated that we not limit our definitions to catastrophic events I would like to use a case which represented a minimal emergency even by my liberal criteria. The "no-name" storm of 1982 provides an excellent case study of a manageable minimal emergency whose most disastrous impacts were the noticeable absence of essential science and technology. At least one responding agency has titled the no-name storm as a training opportunity, it offers many lessons for use even after almost eighteen months.

As a sub-tropical storm, the "no-name" storm was of little interest to the National Hurricane Center. Although they followed the weather system, the information provided was largely as a courtesy. But what if the storm had intensified? Although there may be many arguments surrounding the scientific progress of hurricane forecasting, the reality is that the forecast represent critical decision making input for state and local emergency managers. Yet despite tremendous improvements in communications technology, emergency managers are forced to base their decisions on information that is inferior to that available to the local TV meteorologist. The science, track and storm impact forecasting, is available but the technology that would allow use of that essential scientific input was not available.

In this case the hurricane technology gap is but conjecture, surely in a sub-tropical event the local meteorologist as part of the National Weather Service has at least a better linkage to local decision makers. Only if the decision maker goes to the meteorologist!! Only the phone and possibly the weather teletype link the two. Generally local emergency managers have not developed a phased approach to decision making that bases decisions on gradually improving scientific input, but that's just as well since the input is not reasonably available.

The scientific and technological tools that would have allowed the application of event and impact forecasting to emergency

management of the "no-name" storm were not science fiction, they simply went unused or unapplied. Despite mammoth investments by government and private enterprise to develop such tools much of their productive potential remains wasted. If one were to assume that the initial investment was unimportant, there remains the tremendous potential loss of property and life to which existing scientific tools are not being fully applied.

The Southwest Florida area which the "no-name' storm affected has been the center of recent state and federal attempts to improve decision-making through an application of science and technology. As part of this effort meteorological forecasting and impact models have been combined with transportation modeling and social response research to provide a dynamic tool to assist emergency managers. These tools provide emergency managers with a phased approach to emergency decisions as opposed to the all or nothing criteria usually applied to emergencies. Despite these major benefits, these studies have highlighted the regional character of such events and conditioned local and state authorities to a process based on informed and coordinated decisions. During this particular event we were able to provide minimal information flow through hand computations and commercial phone lines. Participants recognized that such a limited capability to apply science was barely acceptable in even a sub-tropical storm and would have been totally inadequate in a major event.

Again, the "no-name" storm demonstrates an emergency management system that often finds itself unable to apply useful scientific tools not because appropriate technology does not exist, but because it simply has not been provided. It must be noted that had the storm occurred in another area of the state, we would have similarly been unable to apply even the scientific tools.

As the storm approached the coast, alert and warning procedures were implemented. With the exception of television, these procedures and the capabilities they reflect have remained basically unchanged since the 1920's!!!! Even the advantages of television are increasingly neutralized as cable and satellite systems encourage the resident to view remote stations that are either unconcerned with a particular event or may be reporting information related to the location of the station rather than that which is pertinent to the viewer's area.

The Southwest Florida area which the storm struck is the location of some of the state's most beautiful and expensive coastal developments. The taxes for these properties are established by computer; modifications are monitored by aerial and in some cases satellite telemetry; and rush hour traffic in several of the urban areas is controlled by computer. Despite all of this science and technology, the flood gauge that would have warned residents to take protective actions along the Peace River required on site reading; property values available in tax

records had to be collected from each individual property owner as damage was assessed; and recovery operations were controlled and documented using only the most basic of administrative resources.

One might argue that despite all of these shortfallings in the use of science and technology, affected local governments and individuals received necessary assistance. One might even argue that in such a small scale event that the local governments if not the individuals should have been able to cope with such a minor emergency. However for the purposes of our consideration today there are far more relevant points. Without question the most basic of administrative automation systems would have paid for itself in the savings on this single emergency. Certainly, a remote sensing device on the flood gauges along the Peace River would have allowed the movement of sufficient furniture, later covered by disaster assistance claims, to offset several years worth of monitoring costs.

My intent over the last several minutes was to use the "no-name" storm as a case study in the basic opportunities for the application of science and technology to emergency management. If a relatively insignificant event such as this sub-tropical storm offers such an opportunity, I hope that you can imagine the demand that is created by true disasters that occur daily in our fragile marriage of man and his environment. I hope also that the case study has demonstrated the immediate and cost effective opportunity to apply the scientific tools and technology that we have all but taken for granted in other fields to our critical needs during emergencies. Almost without exception we can triple or quadruple the efficiency and effectiveness of emergency management by applying the technology

I am sure is available in your own offices; by using many of the same analytical tools already applied to urban and transportation systems; and by designing our emergency products and public information utilizing the research and marketing techniques commonly applied to cereal products.

Over the last six years Florida has experienced both frequent and widely varying emergencies ranging from the "no-name" storm to the Mariel Boatlift. Our experience has demonstrated to us a tremendous opportunity to enhance public safety through an improved emergency management opportunity. The application of rudimentary scientific tools to our hurricane evacuation planning effort has moved the state to the international forefront in multi-jurisdictional evacuation planning efforts. Similar opportunities are possible throughout the emergency management field. Florida in considering its annual losses finds that it literally cannot afford not to either provide additional resources to allow better utilization of science and technology or as a bare minimum to reallocate available resources to meet the same end.

I would suggest to you that as the first phase of a policy to improve the application of science and technology to emergency management, we must assure that the most basic of tools and techniques available are applied to this critical service. We often measure the need for improved technology of the day to day budget of an activity. In this case science and technology offer the best available loss reduction opportunity, reduction of the physical and fiscal losses incurred in each emergency and reduction of the waste and inefficiency in our response to these emergencies. Consider that in many of the nation's urban areas speeding and traffic citations are issued by computer terminals located in individual vehicles, yet state and local governments, and to some extent federal agencies are managing emergencies such as hurricanes by legal pad. Thank you.

Mr. GORE. Thank you very much. That certainly puts the hearing into perspective.

I have several questions. I'm going to try to compress them so that we get away for lunch and the afternoon workshops can begin in a timely fashion.

First of all, Dr. Brugioni, during the Carter administration, wasn't there a process established by Presidential directive for the declassification and sharing of imagery with civil agencies?

Mr. BRUGIONI. Well, the information—the classified information—is given to a given department. They could use and extract the data, but they could not show the data—the actual photography.

Mr. GORE. Yes.

Mr. BRUGIONI. Now, during the Carter Administration, there were several proposals to take the older satellite information and declassify it. That never—never happened. I wish it would have.

Mr. GORE. Yes.

Mr. BRUGIONI. The older—see, as you come in with newer satellite systems, the question that's often raised is, why not share that older satellite information with the civilian sector? By that, I mean declassify. The Central Intelligence Agency does share its information with the other agencies. Unfortunately, what they have to do is take the information and put out an unclassified piece of information.

Mr. GORE. I see. Can you describe for us the public policy reasons for insulating the DOD and intelligence imagery from civilian use?

Mr. BRUGIONI. It's not—it's there available for the civilian agencies to use it.

Mr. GORE. Yes.

Mr. BRUGIONI. All they have to do is provide the security in terms of what the systems—capabilities of the systems.

Mr. GORE. There's no other barrier?

Mr. BRUGIONI. No; the CIA has—in agreement with a number of civilian agencies—allowed them to use the satellite materials.

Mr. GORE. Yes; so you're saying to us that there is an inertia on the part of emergency management agencies that leads to a failure to use this data?

Mr. BRUGIONI. That's right.

Mr. GORE. And you're pointing out how extremely valuable it can be in emergency management and you're sort of—you—you—you're saying to the emergency management establishment, if you will, local, State and Federal, "You're missing an opportunity by not making more use of this unique resource"?

Mr. BRUGIONI. Yes; I feel sorry for the people. Whenever you have an emergency, the people in the affected area take a terrific beating. Why didn't they do this and why didn't they do that? Unfortunately, many of the people that are—say, that were out in Salt Lake City or in California, they don't—they didn't know anything about these capabilities. They didn't call for them. You can't blame them because they simply didn't know that these capabilities existed.

Mr. GORE. And you specifically testified that the recent disasterous flooding in the West might have been prevented and certainly could have been substantially mitigated——

Mr. BRUGIONI. Yes, sir.

Mr. GORE [continuing]. By the use of this technology.

Mr. BRUGIONI. About 30 experts in the Washington area, had they been told—30 select people who are very familiar with this kind of activity—had they been told, "Get together and give some warning," they could have done so.

Let me point out: California has been hit by five storms already. There's two more today on the way. The meteorologists point out that these—the storm systems that are hitting California now could last for three additional years. It's not too early to start planning in terms of what would you do if the snowfall in the mountains is as heavy as it was last year.

Mr. GORE. I didn't know they could predict what was going to happen three days from now, much less three years from now.

[Laughter.]

Mr. BRUGIONI. Yeah, they're predicting the weather patterns, maybe I should say.

Mr. GORE. Now, I understand it's possible for agencies to request NASA to lay on a U-2 flight under certain circumstances. Is that right?

Mr. BRUGIONI. Yes; here's a beautiful booklet put out by NASA. It's called "High Altitude Perspective." It's NASA-SP427. Back at the end of the publication, it says "Flight Support. Requests for U-2 flight support should be directed to:" and it gives the address.

Mr. GORE. Well, if you know, could you give me a cost estimate for that 45-minute flight——

Mr. BRUGIONI. Well, that's——

Mr. GORE [continuing]. That you referred to in your testimony?

Mr. BRUGIONI. That's what I'm pointing out. Sir, they have to train pilots——

Mr. GORE. Yeah.

Mr. BRUGIONI. Both the Air Force and NASA have a pilot-training program. When I was out at Beale,[2] I talked to the Air Force, they would be willing, even eager, to lay on flights to train their pilots, and at the same time, gather information.

Mr. GORE. So zero cost.

Mr. BRUGIONI. Exactly. But no one is asking.

Mr. GORE. Well, maybe as a result of this hearing, they'll get some more requests. I dare say that that's a distinct possibility.

I have some questions for other witnesses, but I'd like to yield to my colleague, Mr. Reid, at this point if he has any questions.

Mr. REID. Mr. Chairman, I appreciate your having these hearings and I apologize for being late getting here, but you understand those problems.

I talked to you a little at our recess when we were voting. Your testimony's extremely interesting because we held a day of hearings in Nevada where we talked to the FEMA officials and after having that day of hearings, a day in Blythe, Ariz.—is Blythe in Arizona—I think so.

Mr. BRUGIONI. California.[3]

---

[2] See change in appendix, p. 157.

[3] See change in appendix, p. 157.

Mr. REID. Blythe, Calif. No, we were in Yuma—where in the hell were we?

[Laughter.]

Mr. REID. Anyway, we had some hearings down on the river and Needles, Calif., and then we had a day in Boulder City and Las Vegas. I came away from those hearings convinced that we've got serious problems in the country. Eighty—over 80 percent of all of our disasters that FEMA works with are floods.

We also learned that if there were a major disaster, as was written up in one of the—I think it was Time or Newsweek last week about an earthquake that they know is going to hit California in the near future—they don't know if it'll be tomorrow or within the next 15 to 20 years, but that it's going to hit. And after having heard our best resources available, I know we can't respond to that.

I know it's going to be disaster upon disaster, and I'd like you to comment briefly if my observations are correct. Are we in as bad a shape as I think we're in to respond to a disaster, separate and apart, no matter how bad they may be? The floods are bad, but talk about some of the earthquakes that are envisioned for the next few years.

Mr. BRUGIONI. Sir, if you look at the medical community, you have preventive medicine, diagnosis, and pathology. Disaster relief has not progressed beyond pathology. There's your problem. There is nothing in the way of diagnosis after something happens—to look at the problem in terms of taking an appropriate action.

Mr. REID. We had, Mr. Chairman, and I don't know if staff's had time to relate this to you, but we had examples of the Federal Emergency Management Agency being 5 weeks behind in correspondence to Governors of States.

Mr. GORE. Oh, is that right?

Mr. BRUGIONI. Well, the Governor of Nevada [4] called me. He read the article that I had in the Post, and he said that those were exactly his feelings, but he was glad to see somebody in Washington confirm them.

The problem is not going to get any better. I've been in communication with the Director of the Tennessee Valley Authority. There's an excellent publication that he sent me that's here. It's "Flood Plain Occupancy." We're building in the flood plains. The problem is not going to get any less in the future. It's going to get worse.

Not only that, people are crowding near the ocean. They're asking for trouble and they're going to get it, but there is a bright spot. I think that in the future, you will be able to set sensors on the ground to be read by the collectors in space. The science of transponders is just right here, right with us—and if we could only start putting that science to bear, maybe we could get advanced warnings about things.

I think the testimony here, I thought was just—I'm glad that I came because it reinforces what I said, that we can manage. One thing that I would like to see one day is that with this technology being used, that maybe FEMA can change its name from rather

[4] See change in appendix, p. 157.

than Federal Emergency Management to Federal Emergency Planning and Management.

I think the science and technology is right on the—right on our doorsteps right now.

Mr. REID. Mr. Chairman, thank you.

Mr. GORE. Well, thank you.

Mr. Littlejohn, in New York City, you do have the diagnosis part of the emergency management work. At least your testimony seemed to indicate an aggressive effort to try to learn the lessons from disasters in other parts of the country that New York City might conceivably be faced with at some point in the future. Is that correct?

Mr. LITTLEJOHN. Yes; what we do is each year we do an audit of the city. We take a look at everything's that going on, from the economy, to labor disputes, to meteorological problems, whatever it might be, and we take a look at what the impact would be and what the probability of occurrence, and based upon that, we come up with a laundry list of items we're going to work on.

In addition to that, we monitor everything that's gone on throughout the country, even outside the country, and wherever we see something of interest to New York, we get on the telephone and talk to the emergency managers in other areas, police, fire, emergency medical people, to find out what we can learn, request after-action reports and constantly try to stay on top of, really, what's going to happen tomorrow in the city of New York, and are we going to be prepared for it.

Mr. GORE. Have you ever used aerial photography from small planes?

Mr. LITTLEJOHN. I go up in a helicopter every time we have a problem.

Mr. GORE. Do you?

Mr. LITTLEJOHN. No, yeah, after a snow or something, or flooding. We have our own aerial equipment——

Mr. GORE. Yeah.

Mr. LITTLEJOHN [continuing]. However, we have not gotten to sophisticated photography such as this. We take aerial photographs——

Mr. GORE. Yes.

Mr. LITTLEJOHN [continuing]. However, they're not giving us the intelligence, you know——

Mr. GORE. Yes.

Mr. LITTLEJOHN. Once again, there's a lot of things we'd like to do, but as I brought out in my testimony, due to budgetary constraints, up until this point, I'm very happy now to be getting a computer.

Mr. GORE. Well, Mr. Brugioni testified that a relatively simple camera system in a low-flying aircraft is really the technology of choice in most—most disasters. Is—am I remembering that correctly?

Mr. BRUGIONI. That's right. The—the——

Mr. GORE. The EPA system.

Mr. BRUGIONI. The EPA not only has the cameras and the aircraft, but they also have a small photo interpretation shop——

Mr. GORE. Yeah.

Mr. BRUGIONI [continuing]. Which does spectacular work on the large chemical dumps.

Mr. GORE. In Tennessee, incidentally, I made use of the photo interpretation center—I forget the——

Mr. BRUGIONI. The national photographic interpretation——

Mr. GORE. Yes; there was a tremendous controversy in west Tennessee over the location of abandoned hazardous dump sites, and a series of photographs going back over a period of 30 years showing activity in that selected geographic area was extremely helpful in answering many questions.

Mr. BRUGIONI. I'm a great advocate of the use of aerial photography in the historical process. And when they started looking for chemical dumps, I mentioned the fact that there was some photography down at the National Archives called the triple A. In the 1930's, the Agriculture Adjustment Administration—they would pay you to plant a crop but at the critical harvest time, you were supposed to plow it under—primarily clovers, and alfalfas, and so forth, and the way they checked on you was to fly over you and made sure that you had plowed it under.

Well, lo and behold, a lot of that photography shows the chemical dumps as they existed at that time. Involved in that are some spectacular photography of Love Canal and many other areas. So, indeed, that older aerial photography can serve a purpose in locating dumps.

What had happened many times in the chemical dumps, they would come into a farmer and say: "Well, you know that 20-acre site that you've got there. It's not very productive. Could we—we'll pay you so much." The farmer would allow them to dump the chemicals. They would fence it in. In the meantime, trees and shrubbery would grow up concealing it today. But you can go back in the older photography and locate it, and locate it very easily.

Mr. GORE. Mr. Littlejohn, what Mr. Brugioni says about the national system, generally, I suspect is true, that most emergency managers don't have the luxury or take the time—perhaps I should say they regard it as a luxury—to intensively analyze other disasters and try to take a quality control process, if you will, to try to learn lessons from other disasters.

Based on your experience, would you advise other emergency managers to give that task a higher priority? Has it been very valuable for you?

Mr. LITTLEJOHN. Absolutely, yes. As I mentioned earlier in my testimony, just the air disaster of Air Florida back in January of 1981 was very informative. I think we put together a pretty good process in New York City with our mayor's emergency control board, but during that air disaster, you found that you had firefighters from Arlington, you had police—Federal Park Police responding, you had Washington, D.C., park and fire responding, and you had no one in charge.

So I think it was very good because it gave us another look to look a little further—although I think we have the city pretty well under control, but what happens if it brings in another county or, you know, an overlapping jurisdiction?

So it gave us an opportunity to take a second look at what's going on, particularly on our borders, if, in fact, we were to have a

similar disaster with people responding. We do have agreements with the Air Force Port Authority Police that we will handle certain serious items and they will handle the more nonserious occurrences.

Mr. GORE. Well, it seems to me that it might make sense to just plan on analyzing for the country, for FEMA to plan on analyzing most every disaster that comes along above a certain scale, in recognition of the central lesson of quality control, that every mistake is an opportunity to learn. We've certainly got enough opportunities to learn around the country and I think we could make a lot more rapid progress if we established the kind of system you evidently have in New York City on a national basis.

Mr. BRUGIONI. Sir?

Mr. GORE. Yes.

Mr. BRUGIONI. If you look at the electromagnetic spectrum, and if I hold my hands out like this, it would start with cosmic, and go through infrared, and so forth. The visual is just about that big [indicating]. Just a very small area. So that you have to use these other sensors.

Here's an example. There's a NASA aircraft[5] with a variety of sensors, a family of sensors that can be used in various disasters.

Mr. GORE. Yeah.

Mr. BRUGIONI. They should be used. They must be used.

Mr. GORE. Well, that's an excellent recommendation.

Dr. Dobson, what types of dry runs would you suggest which could fully and realistically test some of the emergency preparedness systems now in existence?

Mr. DOBSON. What I can say along that line is you can't just adopt part of the system. You can't just take the mapping capability or just the video capability and do much with it. You have to be in place.

For instance, to test our system, you would actually have to be resident at Oak Ridge until we can work out this problem of networking. So I think that, you know, we would certainly welcome, if anyone wanted to come up with some arrangement to come and work on our system and try it in an emergency, simulated emergency. The one that we could do best right now, of course, would be the Sequoyah nuclear plant. We've done the most processing there. It would be a fairly low-cost item to do something like that.

Mr. GORE. Uhhuh.

Mr. REID. Mr. Chairman, would you yield?

Mr. GORE. Sure.

Mr. REID. Dr. Dobson, I listened a couple of weeks ago to a presentation by Carl Sagan, and in that he portrayed, of course, a very black picture in case there was a nuclear confrontation between the Soviet Union and the United States. And was he using basically the same type of information, same type of technology that you're using here to arrive at his conclusions, or do you know?

Mr. DOBSON. Well, I don't think he was using this—I'm aware of the type of system that they have at Cornell. It's a much smaller system and I doubt that it could have been used for doing the

[5] See change in appendix, p. 157.

whole United States that intensively, but, you know, he was talking about nuclear warfare; I was talking about a nuclear powerplant accident.

Mr. REID. Same principle, though, wouldn't it be?

Mr. DOBSON. Well, no, no, I couldn't say that. There are certain common information needs and—several years ago, this system was used to project the likely—well, take a scenario of nuclear attack and project radiation levels for the entire United States and that material has been published.

Mr. REID. Using this method here.

Mr. DOBSON. Using part of this system, yes, but it was—there was no calculation of dust levels related to climatic change.

Mr. REID. So you're saying, from the information that you have, the Cornell model doesn't cover as wide a range of the country as does yours?

Mr. DOBSON. Now, let me make a distinction there. Cornell has a computer graphics laboratory and they're operating on a smaller system. I don't know what kind of system——

Mr. REID. I understand.

Mr. DOBSON [continuing]. Carl Sagan used. He may have had access to NASA for all I know.

Mr. REID. Thank you, Mr. Chairman, for yielding.

Mr. GORE. Now, this is the so-called TAPS study, after—the acronym is initials of the authors—and I'm not sure whether it was done at the Cornell center or not, the technical work, but in any event, Mr. Wilkerson, what do you think about dry runs? Do you think they would be useful in identifying ways to improve these systems that you describe?

Mr. WILKERSON. I think both the dry runs and the postincident review are critical elements of managing this particular program. The dry runs, particularly those that have been used, the exercise program that's been used in the radiological emergency preparedness program, has brought about some significant changes in the way we deal with emergencies and the way we collect information, prior to an emergency, so that we can cope with it.

So I think they're critical. They also offer a critical opportunity to get beyond the senior level management level and to get out into the field and involve some of the people that have to take samples, or do the monitoring to make sure that the training program has permeated throughout the program, and is not simply a question of we, or are charged to make decisions, think we know what we're supposed to do, but it turns out that when we order something done, that that law enforcement officer is not familiar with the program at all, and therefore, can't comply.

Mr. GORE. Dr. Dobson, as our networks become increasingly comprised of highly sophisticated components, don't we need to be conscious of the importance of maintaining simpler backup systems? Would you agree with that?

Mr. DOBSON. Yes, I think that we should adopt the—the policy that you apply the simplest mechanism you possibly can, then try to follow it in the immediate instance, and then try to follow it up with something more complex, as you have more time. A lot like I described with the nuclear accident.

Mr. GORE. Uhhuh.

Mr. BRUGIONI. In following that up, sir——

Mr. GORE. Yes.

Mr. BRUGIONI. I think that whenever you do have an emergency—say out at Salt Lake City—get the officials in Washington that are very cognizant of these systems and get them out to Salt Lake City, or get them out to California—wherever the emergency exists. Get the experts out there so that they can communicate back to Washington and get things done.

Mr. GORE. Well, we're going to—I could ask a number of other questions, and indeed I have some, perhaps we can submit them in writing, if they're still of keen interest after tomorrow's session.

I want to thank each member of our final panel. You've made a tremendous contribution and the work you do on a daily basis is of enormous significance. We appreciate your help.

As I mentioned at the outset, the subcommittee is quite excited about the prospect that the workshop sessions, which will soon begin, will result in some major improvements in our understanding of which direction we need to go in from here. I think our witnesses in this morning's hearing have provided an excellent beginning.

The workshops will be this afternoon and, as the participants know, tomorrow morning as well, and then at 1 tomorrow afternoon, we'll all reconvene here in this room to get the summary presentations from each one of the workshops, and I look forward to those results. I wish you well in your meetings.

Again, thank you very much to our witnesses.

[Whereupon, at 1 p.m., the subcommittee was adjourned, to reconvene at 1 p.m., Thursday, November 17, 1983.]

THE ROLE OF INFORMATION TECHNOLOGY IN EMERGENCY MANAGEMENT

THURSDAY, NOVEMBER 17, 1983

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT,
Washington, D.C.

The subcommittee met, pursuant to notice, at 1:05 p.m., in room 2325, Rayburn House Office Building, Hon. Albert Gore, Jr. (chairman of the subcommittee) presiding.

Mr. GORE. The subcommittee will come to order.

This afternoon, the subcommittee continues its hearings on information technology and emergency management. Yesterday, our witnesses gave us an excellent overview of the Nation's technological ability to prepare for and deal with natural disasters and other emergencies.

We learned at our hearing that information technology can play a crucial role in both anticipating and responding to disasters.

Today, we reconvene these proceedings in order to hear reports from a number of workshops conducted yesterday afternoon and this morning on the same subject.

After we adjourned yesterday, over 100 of the leading experts in the country met in these workshops to discuss the various technological and human aspects of the problem. We feel indeed privileged to have the benefit of such collective experience and wisdom. We have also been fortunate to gather together specialists from such a diverse geographical sample with over one-third of the States represented.

We know that your task was a difficult one and we want to express our deep appreciation for your willingness to tackle these issues that have been raised. It is because of your expertise that we are most anxious to receive your findings and recommendations.

We are going to take each of the groups in turn, beginning with group I. I would like to ask Dr. James Morentz, the president of Research Alternatives, Inc., and Dr. Charles Wittenberg, president of Wehrman Consultants Associated, Inc., to come to the witness table.

Group I was on interactive decisionmaking and we are very interested in the report of Dr. Morentz, as group leader, and Charles Wittenberg, as rapporteur.

29-457 O—84——8

STATEMENT OF JAMES W. MORENTZ, JR., PRESIDENT, RESEARCH ALTERNATIVES, INC., ACCOMPANIED BY CHARLES WITTENBERG, PRESIDENT, WEHRMAN CONSULTANTS ASSOCIATED, INC.

Mr. MORENTZ. I would like to thank you for the opportunity to have spent the last couple of days dealing with this topic. It is one that is of keen interest to all of us, and we all should express our appreciation to you for being a focal point for us to be able to get together.

I also need, without anything other than sincere thanks, to thank my group—and it should be really all of us sitting up here because this is genuinely a composite of the thoughts that we had over the last several hours and that brought together people who really range the whole United States and the whole field of emergency management and information technology, with representatives from the Federal, State, and local levels.

As I said very briefly after we all introduced ourselves to each other, we make a darned good consulting company. [Laughter.]

Mr. MORENTZ. You have the benefit of that.

I have the group members' names that I would like to enter into the record.

Mr. GORE. Without objection, we will include that at this point in the record.

Mr. MORENTZ. Thank you.

[Material to be supplied follows:]

PARTICIPANTS OF WORKSHOP ON EMERGENCY MANAGEMENT

November 16-17, 1983

Group I - Interactive decisionmaking involving Federal-State-local governmental units and the private sector.

Group Leader: Dr. James W. Morentz, Jr.
President, Research Alternatives, Inc.

Rapporteur: Mr. Charles Wittenberg
President, Wehrman Consultants Assoc., Inc.

Participants

Dr. William A. Anderson
Project Director
National Science Foundation

Mr. Robert L. Beckman
Lecturer
The American University

Dr. T. Michael Carter
Senior Social Scientist
National Weather Service

Mr. James L. Christopulos
Senior Environmental Engineer
Department of Housing and Urban Development

Dr. Jean Garrison
Deputy Chief - Center for Mental Health Studies of Emergencies
Department of Health & Human Services

Mr. Harold Gaut
Health Physicist
Federal Emergency Management Agency

Mr. Ramon F. Granados
Acting Director, Deputy of Fire-Rescue Services
Montgomery County, Md.

Mr. William D. Harris
Fire Chief
Oak Ridge, Tennessee

Mr. Alexander Hunter
District Attorney
Boulder, Colorado

Mr. Thomas Laetz
GAO Evaluator
General Accounting Office

Mr. Lou Martino
Maryland Hazardous Waste Division
Department of Health & Mental Hygiene

Mr. James H. McCain
Geoview

Dr. Clark Norton
Section Head - Gov't Division, CRS
Library of Congress

Dr. William Petak
University of Southern California

Ms. Claire Rubin
Director, Natural Disaster Research Center
George Washington University

Dr. Ralph Sklarew
President
Form & Substance, Inc.

Mr. Harry Strong
Department Head
Mitre Corporation

Mr. William Wallace
Chairman, Department of Statistical Information & Management Science
Rensselaer Polytechnic Institute

Mr. Graham Watt
Consultant
Ft. Lauderdale, Fl.

Mr. Robert Welch
Research Alternatives, Inc.

Mr. Robert Wilkerson
Division Director, Division of Public Safety, Planning & Assistance

Dr. Elizabeth Young
President
Public Service Satellite Consortium

Mr. Edward Zimmerman
Consultant
Falls Church, Va.

Mr. MORENTZ. We, in looking at intergovernmental decisionmaking in emergency management at the Federal, State, and local level, found the scope of the task really beyond what anyone could sit down and spend a few hours talking about.

As a result, we attempted to bound that task by defining, as carefully as we could, where we thought congressional initiatives could have the greatest payoff. We bounded the task in a couple of different ways.

The first way was by defining our effort as one that would aid decision support, that is, provide technologies that would help people make decisions. The technology encompasses the whole range of things that we saw yesterday but in particular are those that are expressly designed to help a local, State or a Federal emergency manager decide on an action.

Some of the things that we saw yesterday are not expressly made for rapid-fire decisionmaking. Later on we will discuss one of the tasks at hand, which is to take the technologies that are arrayed before us and come up with the best and most expeditious fashion to apply those into the emergency field.

The second way that we bounded our discussions was by defining what is this emergency management that we are dealing with. We attempted to expand as broadly as possible on the idea of what emergency management is.

If I could just flip this on the board. Looking at the screen is a definition of something called comprehensive emergency management. As the first group, we will take an extra minute of the time of the proceedings to explain the broadest definition of what emergency management is so that we can see where technology applications have an opportunity to come to play.

[The material referred to follows:]

FOUR PHASES OF COMPREHENSIVE EMERGENCY MANAGEMENT

	MITIGATION (LONG-TERM)	PREPAREDNESS (TO RESPOND)	RESPONSE (TO EMERGENCY)	RECOVERY (SHORT AND LONG TERM)
1	**DEFINITION:** Any activities which actually eliminate or reduce the probability of occurrence of a disaster. It also includes long-term activities which reduce the effects of unavoidable disasters.	**DEFINITION:** Preparedness activities are necessary to the extent that mitigation measures have not, or cannot, prevent disasters. In the preparedness phase, governments, organizations, and individuals develop plans to save lives and minimize disaster damage. Preparedness measures also seek to enhance disaster response operations.	**DEFINITION:** Response activities follow an emergency or disaster. Generally they are designed to provide emergency assistance for casualties. They also seek to reduce the probability of secondary damage and to speed recovery operations.	**DEFINITION:** Recovery continues until all systems return to normal or better. Short-term recovery returns vital life-support systems to minimum operating standards. Long-term recovery may continue for a number of years after a disaster. Their purpose is to return life to normal, or improved levels.
2	**GENERAL MEASURES:** Building codes Vulnerability analyses updates Tax incentives/disincentives Zoning and land use management Building use regulations/safety codes Compliance and enforcement Resource allocations/interstate sharing Preventive health care Public education	Preparedness plans Emergency exercises/training Warning systems Emergency communications systems Evacuation plans and training Resource inventories Emergency personnel/contact lists Mutual aid agreements Public information/education	Activate public warning Notify public authorities Mobilize emergency personnel/equipment Emergency medical assistance Man emergency operations centers Declare disaster/evacuate Mobilize security forces Search and rescue Emergency suspension of laws	Damage insurance/loans and grants Temporary housing Long-term medical care Disaster unemployment insurance Public information Health and safety education Reconstruction Counseling programs Economic impact studies
3	**HAZARD SPECIFIC MEASURES** **FLOOD:** Dam construction/inspection Stream channelization Construct/protect retention basins Reforest/prevent deforestation Contour farming Flood proof buildings	Temporary levee construction Stream flow monitoring Ice and debris removal Sandbagging Temporary flood proofing	Helicopter search Boat rescue	Decontamination of water sources Replant crops Pump out flooded basements Remove temporary floodproofing Monitor disease
	EPIDEMIC: School innoculations Rodent/insect eradication Water purification Sanitary waste disposal Health codes/laws/inspections Public health education	Stockpiling drugs Physician preparedness plans Public notification Quarantine regulations and plans Emergency medical authorities	Quarantine Disinfect property Secure bodies Isolate carriers	Continuing research into causes Long-term restorative therapy
	FIRE: Fire codes No-smoking laws Fire zoning Fire safety information	Fire drills/exit signs Call boxes/smoke detectors Police crowd control training Fire department aid agreements Firefighter training Automatic sprinkler installation	Firefighting Containment	Rebuilding Razing burned-out buildings Reforestation
	HAZARDOUS MATERIALS SPILL: Transport speed limits Container structure codes Corporate licensing Restricted routing Materials identification codes	Containment and scrubbing equipment Stockpile neutralizing materials Emergency training for transporters Special apparatus for emergencies	Identify material Notify National Response Center/CHEMTREC Containment Plume tracking Air/water/soil contamination controls	Reassess existing regulations Decontaminate environment
	LANDSLIDE: Forest management Preserve ground cover Maintain natural runoff Stabilize slopes Real estate disclosure laws	Reinforce threatened structures Landshift monitors	Assess stability of new formation Reinforce against secondary slippage	Reseed denuded areas New land-use planning
	WIND: Roof anchors Window size and thickness codes Mobile home tiedowns Windbreaks	Storm shelter construction Property protection measures Storm watch and warning guides	Reinforce damaged property Broadcast all-clear	Reconstruction
	HURRICANE STORM SURGE: Barrier islands Coastal wetlands protection Replace coastal sand dunes Construct breakwaters/levees Coastal zone management Public information programs	Vertical evacuation plans Storm tracking Shutter windows Seek shelter Evacuate planes and boats	Same as for flood/wind (above)	Rebuild destroyed sand dunes
	GASOLINE SHORTAGE: Alternatives research Allocations/international sharing Mass transit systems/car pooling Design energy efficient engines Reduce speed limits Energy conservation program	Stockpile reserves Reallocate to shortage areas Rationing plans	Odd-even purchase program Minimum purchase requirements Increase refinery production Deregulate oil Increase gasoline prices	Excess profits tax on companies Reassess allocation plan Two-way truck hauling
	NUCLEAR PLANT ACCIDENT: Site zoning Waste management/containment research Plant safety codes/inspections Plant operator training Environmental impact research/statements	Contamination monitoring Identify vulnerable populations Shelter preparation Designate Governor's technician Emergency procedures rehearsal	Contain radioactivity	Reassess siting requirements Monitor deterioration of contaminant
	ATTACK: Continuity of government plans Crisis relocation plans Coordination of defense/all-risk plans Maintenance of National Guard/Reserves Host area/hardened shelter development	Defense mobilization plans Reserves training Protection of vital records Disperse government line of succession Designate vital workers	Deploy critical resources Activate rationing Crisis relocation Activate vital workers plan	Reinstate government operations Develop/organize communities

Often recovery includes mitigation measures against repeat of the disaster. Thus recovery and mitigation are related —showing circular nature of mitigation, preparedness, response and recovery.

EACH COLUMN SHOWS:
1. A definition of the phase;
2. Examples of general measures which apply to all hazards; and,
3. Examples of specific measures which apply to particular hazards.

This chart was developed for use by comprehensive emergency management review leaders. Many of the measures could be debated. We encourage clarification, editing and suggestions for making it more useful.

Contact: Hilary Whittaker, Director, Emergency Management Project
NATIONAL GOVERNORS' ASSOCIATION (202) 624-5365

Emergency management begins with the long-term attempt to mitigate, prevent, or avoid disasters. This involves the assessment of where those hazards lie and the attempt to make efforts to not have a disaster happen.

Of course, disasters are going to happen and in order to best respond to those, you must prepare to respond. The third column shows the response to the actual emergency, and the recovery takes place in the short-term restoration of facilities and the far longer term restoration of the entire community to its social, psychological, economic and mental health as it was before the disaster occurred.

Down the columns is a variety of different hazards, and we feel that information technologies should not be specific to hazards but our emphasis needs to run the whole range of interrelated hazards because there are a few hazards that occur in the absence of any other secondary disasters.

We look at each one of those different kinds of hazards—again in attempting to bound our discussion—and find that really, we are concerned about those emergencies that are nonroutine, those that take the decision maker into unknown territory. Those can come about in several different ways.

The first way is, they can be those that are so large that a single jurisdiction simply cannot handle them. There are those hazards that cut across jurisdiction because of their very nature—a large earthquake that would deal with both Federal, State, and local responses, as well as multi-jurisdictional response at the local level. As well, there are those kinds of emergencies that are of such a specialized nature that a local jurisdiction would not have the resources or expertise, or knowledge, to be able to deal with those hazards.

What we are really doing is looking for the disasters that are nonroutine, of which the rate of repetition is not sufficient to reinforce the routine emergency response.

With that as our bounds—and that still is a fairly large boundary—we want to make one additional sort of caveat about our comments. That is that these recommendations are not limited to the Federal Emergency Management Agency, although they have been a primary agency of discussion here, but we are talking about a Federal program, one that will reach out into any of the different agencies and one in which the partnership with private sector organizations is going to be equally important.

The essence of the set of recommendations is that we were not being cavalier but we felt that we could almost, in a sense, dismiss hardware considerations as any sort of major emphasis on what Congress or the Federal Government should be doing.

As well, there is a strong emphasis that we could probably dismiss software as something that we should concern ourselves with, or even the kind of assessment of, "What are you going to do when you get your computer system" or whatever the advanced technologies are.

The technologies are there; the needs have been clearly definied. What we are trying to do is marry technology to activities that already take place on a manual, routine basis during emergencies, with the attempt to improve the operations of those people who are

managing emergencies, particularly those who are making decisions about emergencies.

Let me then bring to you a series of recommendations, as it were.

The first one is—cutting right to the heart of it—money. There needs to be a special line item, a special fund at whatever Federal agency or Federal program level that says, information technologies in emergency management are essential, and without the funding it simply is not going to happen. We had a lengthy discussion about the opportunity for the marketplace to take care of these needs and many people, having explored the marketplace in these technology applications, I think, were in general agreement the marketplace alone is not going to satisfy the needs.

What, then, is the principal need? It is for a center of some form. We kicked around lots of terms, all of which had connotations that we did not wish to choose. We had terms that ran to clearinghouse in technology transfer, to networks, and one of the titles we threw around was, the Technology Resource and Decision Support Center.

Whatever the mechanism is, there is an absolutely essential need for a mechanism to catalog, inventory, develop, evaluate, and create baseline descriptions of the information technology tools that are appropriate to emergency management.

I would add, there are many, many examples of this kind, none of which—or many of which—have their failings. So, it is not simply a clearinghouse like the National Institute of Education has or any of those other activities. It is a composite of a variety of activities that would encourage the whole panorama of activities and evaluations to take place that would enable us to incrementally, step by step, move towards an information society in the emergency management community.

This center or mechanism—and I will refer to it as a center for want of a better term—we suggest should be outside of Federal agencies. The feeling is that there are cultural problems, political problems, associated with a mechanism that would serve to gather information and inform those if it is based in a Federal agency, simply in making decisions about what information is exchanged it seems, frequently raise policy issues that the Federal agency has to address but another entity would not have to address.

There are, again, many potential solutions here: a nonprofit organization developed, perhaps funded by the States, some Federal seed money. And we would say that there is no essential nature or reason for the services to be provided free. There is a considerable credible record of services being better used when they are paid for because it is a commodity of exchange, and the free services sometimes tend not to be as effectively used.

So, we would see this exchange mechanism as possibly providing a service based on a subscription after some initial, presumably Federal though perhaps Federal and private sector cooperation, development of the center.

Among the other activities that need to take place—not necessarily under the eagis of the center although that is a possibility—is sort of a little checklist of opportunities that we would recommend be included in congressional initiatives toward the Federal program.

The first of these is sincere dedication to applied research on information technology applications in emergency management. We saw a beautiful array of opportunities that do not culminate in emergency decision supports yesterday. The research into the application of these is absolutely essential.

This research is going to span both the technological side and the social science side of decision support. But there was general concurrence that we need no more studies on white mice or their equivalent in basic research; this is applied research.

Again, the source of this research could be a variety of places, from the National Science Foundation to FEMA, to anywhere else.

The second point in this little checklist is a requirement for the exchange among Federal technology providers of those technologies, information about those technologies, and discussions of their application to emergency management. There is absolutely no reason why that discussion that took place yesterday—all of which were old technologies, there was nothing there that was not there 2 years ago when we met before, and 5 years even before that. But they are not being talked about. They are not being exposed by the emergency management people who can identify them as possible applications. That, as a Federal initiative, is something that could take place tomorrow with simply setting up an agenda for Federal agencies to talk about their opportunities in emergency management.

The third item, one that really spans the whole range of other recommendations, is the essential need for quality control and assessment of these technologies in their utilization, their practical application, and in their effectiveness. The emergency management field is constantly undergoing incremental improvement. Technology is undergoing incremental improvement, and to say at any one time that this is the state-of-the-art is going to be dangerous. It needs to be evaluated, it needs to be constantly improved.

An additional item, number four, is training. Without training of the users, technology will go no place. Training offers us two opportunities:

First, it provides an opportunity for skills improvement—absolutely essential in the emergency field.

Second, training also provides an opportunity to test the appropriateness of technologies, to have any of those technologies that we saw before put into a concerted effort to provide them in an exercise at any one of the state or local, or Federal levels, and actually implement that technology on a prototype basis and run it through the exercise before we begin to market it, sell it, disseminate it—a real opportunity of training.

The fifth item is one that the Federal program should encourage, the putting in place of a networking scheme that would work not unlike some of the things that Tom Belden talked about two years ago in linking up WAT centers, and not unlike the things that are available in the military and in the big holes in the ground where everybody is going to command World War III and all that.

But we need it here, now, at the grassroots of emergency management where the local emergency manager can pick up the phone and network with experts who have the experience based on

the lessons that they have learned in past emergencies, and get answers.

This access to outside resources is not to the exclusion of computer networks, it may very well utilize some computer teleconferencing networks, but the key thing is people to people. That fits in as part of the information program.

There are two final points to this program that need to be made that, we suspect, are going to be discussed in some of the other groups. But they become almost enablers of all the other things that we have talked about.

The first one relates directly to the networking, and that is the liability issue. If someone is going to become an expert and counsel a local emergency manager—not making a decision for him but explaining a decision that was made in the past—some shielding of that expert needs to take place. There are "Good Samaritan" laws, many of which are coming under challenge now; liability could bring to a halt the networking of individuals.

The second thing is that a communications infrastructure is the basis for all this. Without the secure, survivable communications network none of the networking, none of the teleconferencing, none of the center discussions, can ever take place. The current emphasis on the military side of communications systems that are only—not speaking as an expert—but only ideosyncratically available to civil emergencies, causes us some problems. The emphasis on a civil communications system for civil emergencies is one that we think needs to be addressed further.

That, roughly, describes the discussions we have had and I will conclude it there.

Mr. GORE. Well, that is very, very helpful.

Mr. Wittenberg, do you have anything to add to those comments?

Mr. WITTENBERG. No, I do not. I think Jim did a very fine job with our group after ferreting out a lot of discussion items this morning.

I think one thing we have to keep in mind is, when we deal with technology in that, the training of the local user is what we are really concerned about. That is the person where the disaster happens. That is the area where it all happens. If those people can use this information and use the high-tech type of information for that use, then I think we have accomplished a lot.

If it does not get down there, we have not done anything with it.

Mr. GORE. Well, these recommendations are very significant and they gain added significance because they come out of such a lengthy discussion among the leading experts in the country. They will certainly be helpful to us in drafting our recommendations for legislative action.

I want to thank you for your contribution to these hearings. I appreciate it very, very much.

Before we have the second group, with your patience and indulgence, during the end of the session of Congress there is always a series of significant votes. I am going to ask your indulgence for about 7 or 8 minutes and, when we come back, we will hear from Mr. McManis and Dr. Vallee and the summary on the second group, the value of simulation.

So, we will stand in recess for about 7 or 8 minutes.

[Recess.]

Mr. GORE. The subcommittee will come back to order. We are going to hear from the second group now. The group leader was David Y. McManis, National Intelligence Officer for Warning at the Central Intelligence Agency. The rapporteur was Dr. Jacques F. Vallee, consultant, from San Francisco, Calif.

Mr. McManis, please proceed.

STATEMENT OF DAVID Y. McMANIS, NATIONAL INTELLIGENCE OFFICER FOR WARNING, CENTRAL INTELLIGENCE AGENCY, ACCOMPANIED BY JACQUES F. VALLEE, CONSULTANT

Mr. MCMANIS. Thank you, Mr. Chairman. It is really a great pleasure for me as well to be here and I believe that when I talk about our final conclusions you will find how personally I can relate to this in my current position because we really are talking about warning issues today.

Once again to really echo and second Jim's presentation, I have to pay great credit and tribute to my particular group.

As you will notice on the screen, we really have a real cross-section of both governmental, and Federal, local representatives and it has really been a delight to see how they have interacted and they have worked together.

I think we will find as the six chairmen report to you that there are great parallels in our findings which I hope will reinforce the resolve of this subcommittee. I am glad that I am on second and not in the last place because I think it is going to get harder and harder not to be redundant as we go through the day.

Mr. GORE. Let me say that without objection we will include the full list of names at this point in the record. Earlier, I had wanted to ask for unanimous consent—and do so now—to include at the appropriate point in the discussion of group I's findings the graph or chart that was put on the screen at that time.

[Material to be supplied follows:]

Group II - Value of simulating EM situations — realistic scenario development, supported by information technology

Group Leader: Mr. David Y. McManis
National Intelligence Officer for Warning
National Intelligence Council
CIA

Rapporteur: Dr. Jacques F. Vallee
Consultant
San Francisco, California

Participants

Dr. Daniel G. Barbee
Associate
Triton

Dr. Thomas G. Belden
Consultant
Rockville, Maryland

Mr. Louis DeCourval
Wheeler Industries

Dr. Herbert R. Fiege, Jr.
Director, Planning Methods & Systems
Development Service
Veterans Administration Hospital

Mr. Gerard Hoetmer
International City Management Assoc.

Dr. Richard F. Kott
General Electric Company

Mr. Allen Li
Audit Manager
General Accounting Office

Mr. Robert Littlejohn
Deputy Director
Office of Civil Preparedness
New York, New York

Ms. Lois Clark McCoy
Editor-in-Chief
RESPONSE Magazine

Mr. Russell Salter
Senior Planning Officer
Federal Emergency Management Agency

Mr. Corwin D. Strong
Safety Officer
National Institutes of Health

Mr. GORE. Go ahead.

Mr. MCMANIS. Thank you.

I will also ask that we enter for the record several minipresentations and papers that resulted from them, specifically two. One by Dr. Richard Kott on the proposal for a National Simulation Center.

The second one an article which was written by Lois Clark McCoy called, "Who is in Charge" which I found to be particularly relevant.

Mr. GORE. Without objection, we will put those in the record at this point.

[Material to be supplied follows:]

A NATIONAL SIMULATION CENTER:

CONCEPT AND CHARACTER

Prepared for:
The Subcommittee on Investigations and Oversight
House Committee on Science and Technology
Hearings and Workshops
November 16 and 17, 1983

By: Dr. Richard F. Kott
General Electric Company
1755 Jefferson Davis Highway, Suite 200
Arlington, VA 22202

NOTE: The views of the author are not necessarily those of the General Electric Company.

A NATIONAL SIMULATION CENTER: CONCEPT AND CHARACTER

As a result of several years experience in politico-military simulation among senior national civilian and military leaders, I developed a proposal for the establishment of a National Simulation Center. I am pleased to have the opportunity in this particular forum to present the concept to you.

The purpose of the proposal is the establishment of a national simulation, gaming and data center which would permit a very wide range of national interests to be kepc in view at all times -- political, military, economic, domestic, international, social, etc. . . . National interests are multitudinous, diverse and increasingly difficult to identify. The issues, problems and questions posed by them are often extremely complex and frequently, in order to favorably resolve them, the entire spectrum of national experience and perspective, military and non-military, become involved. Within the Federal Government, individual problems are studied by many agencies and various committeees of Congress -- often, due to limited organizational perspective, with conflicting results and contradictory recommendations. The simulation offers the opportunity to "get it together".

High-level management and senior-level simulations are profitable working conferences, first order intellectual experiences, stimulating and forward looking -- conferences with involvement and thrust so to speak. In the hands of experienced simulation management professionals, the results can very often add to or expand policy options and deepen insight. Simulations can and are built to provide realism, relevance, crisis management experience, interagency/interfunctional communication and serve to facilitate discernment of protagonist/antogonist perceptions and possible future conduct; enhanced knowledge often provides a basis for altered views on preconceived policy notions; the suggestion of alternative solutions, even new policy actions are often derived from credible simulation.

As the turmoil of the 1960s and 1970s manifestly show, the country in the 1980s needs a better system to explore, and hopefully solve, difficult and complex problems and to provide for planning ahead and contingency evaluation. Custom-built issue specific simulation provides a systematized method for assessing information early enough and comprehensively enough so that leadership can move quickly and adroitly enough to manage crisis and unfavorable events affecting national interests or to exploit opportunities. At all levels, but particularly at the policymaking level, there is a continuing need for information exchange with other organizations, individuals, institutions working the same problems but from different vantages. Policymakers urgently need a center from which data can be obtained quickly -- a central point with ready access to the nation's storehouse of computerized data relevant to its national interests.

Simulation fora provide opportunities for participants to test and assess possible positions and to expand perceptions. The ability to venture into a realm of logic, imagination and choice is a key quality in a policymaker and crisis manager. There is a quest for ideas that can, in part, be satisfied from the dynamic interchange that takes place in a man-to-man or man-and-machine simulation. There is a need to:

- train our leaders to quickly identify, grasp, evaluate, and react.
- more accurately anticipate future problems before drastic policy responses are required.
- develop mechanisms (procedures) to illuminate policy requirements before issues become critical.
- juxtapose the comptetitive interests and changing parameters within the social-political-economic environment, project detectable trends and develop the means to enhance, control or alter those trends.
- manipulate the many variables and interests that affect policy throughout their possible ranges, to better illuminate the changing demands on governmental policies and provide the keys to their proper management.

The diverse experiences and perspectives of participants will provide different perceptions of the same problem -- differences that become sharply visible and highly instructive in the give and take of a simulation. In an environment encouraging full freedom of expression in explaining or defending their positions/perceptions, participants become teachers and students in one and the same time. Thus, the simulation is an excellent educational device as well as an idea exposing/idea generating instrument.

The simulation center as proposed here would provide an expanded interface with all the major components of the U.S. Government as well as academia, labor, and the corporate-world. Its staff would consist largely of "liaison personnel" from these components. Man-to-man simulation is the cornerstone. But the center is intended to include the utilization of man-and-machine and pure machine simulation. Hypothetical, but plausible domestic or international crisis management situations or the impact of significant political, military or economic events will be examined so that new approaches to policy might be developed and options for possible execution evaluated.

Integral to the simulation center proposed is the capability to connect to a single point the nation's major national security, political, economic, international relations, and related topical data banks -- both government and non-government, classified and unclassified. The United States does not now have such a center. If it did, it could most certainly be considered a national resource -- where major corporate interests could be served as well as government -- in fact they could be complementary. The proper security buffers would be provided, of course, for classified data and proprietary information.

The center must be non-political but probably a part of the Government. Ideally it would serve all branches of the Federal Government, academia business, and labor -- but not for hire or anyone's captive. The results and analyses of the various simulations must stand as a product of the participants, not the product of an institution nor a vested interest.

The ultimate goal of this proposal is the establishment of a national center or agency located in a building especially designed for the purpose within the national capital. The initial phase of the plan envisions a pilot model to serve as a base for demonstrating the feasibility and desirability of such an establishment and the development of a plan of implementation. The proposal requires, from its inception, the expressed interest and support of the Federal Government.

To achieve the goal, consultant requirements will be extensive and broad in scope. During the initial phases, garnering the nations leading figures and organizations working in the field of gaming, simulation and data collection is crucial. From the vantage of their own individual specialization and expertise, various facets of the proposal will be explored and translated into recommendations and requirements for the center. Some consultation requirements include: a clearing house for simulation in the social sciences; data base surveys; consolidated access to data banks; teaching-learning attributes sought within the center; simulation as a means of evaluation; as a research center; and physical requirements for such a center.

Manual and man-machine simulation is participative and the rewards are great for decision making and policymaking but serve many other well known purposes as well. The question is not can the nation afford it but can the nation afford not to have it.

Who's in charge?: how bureaucratic lines of authority interfere with modeling and computer simulation in disaster response

Lois Clark McCoy
National Association for Search and Rescue

ABSTRACT

Who's in Charge? In Disaster Management, this simple, but deceptive, question has never been answered satisfactorily; for it depends on, among other things, what the cause of the disaster or emergency is, what level of command is involved, the background of the commander, the resources at his disposal, his native intelligence and his perceived credibility.

As opposed to the fuzzy civilian authority, the military has supplied a clear answer to Who's In Charge?. This has permitted the architecture to employ the new technologies of electronic information and computer simulation for training simulations in C^3I (command, control, communications and intelligence) operations.

While military applications for C^3I are developing into a sophisticated system, what has taken place in the application of electronic information and computer simulation in the civilian field of Disaster Management? Unfortunately, the answer is very little.

Emergency management today remains in the era of chalk boards, butcher paper and felt pens. Certainly, part of the explanation for this rests on the continuing lack, at the bureaucratic level, of a definitive answer to Who's In Charge? of multi-agency disaster response. Computer simulation and software cannot be written for Direction and Control scenarios when there is not an agreed-upon chain of command. This lack, encompassing jurisdictional problems and a general antipathy to change, has hampered the application of new technology in the field of Emergency Management.

In emergency and disaster management, the single bright spot today is the rapid spread of the computerized listing of emergency resources. These applications tend to be heavily weighted toward enterprising individuals in the emergency response agencies and to some form of "home computer," rather than toward the acceptance of new technology by public safety agencies themselves. One of the most successful bureaucratic developments of electronic information is the joint Federal and California State program, FIRESCOPE. But, even here, the general acceptance of the program has been delayed by "turf" problems and by the low level of user understanding of electronic information technology and its potential applications.

To bring disaster management into the present Age of Information, it will be necessary to undertake an analysis of today's direction and control systems and of the people who will operate them. Local and state agencies with emergency responsibility can provide, and agree to, a pre-established chain of command for multi-agency disaster response. At that point, we will know "Who's in Charge" and can proceed with Computerized Simulation in Disaster Response.

CHALLENGES FACING DISASTER SIMULATION MODELING

The application of Computer Simulation Modeling to the comprehensive management of Emergency Response can serve several different applications. Training, and information to be applied in the event of an actual operation, are two that are readily apparent. But the real objective of the Computer Simulation for Emergencies is to maximize the use of information and resources in the time of the "unexpected" emergency. This obviously puts the first unwelcome factor into our equation for the model. In order to build our simulation, we must try to arrive at known parameters. We are not going to be comfortable with the "unexpected."

The second parameter is that emergencies are statistically scarce. Although they happen "constantly," they happen at different times, for different reasons, at different places. This will make the data base for the model very difficult to assemble. However, we can turn this minus into a plus in the argument for the training-aid that our simulation model can provide. By using our model, we can provide a plethora of simulated emergencies for decision managers upon which to practice and train.

The third difficulty in assembling our model is the apprehension among emergency managers that the use of information management and computer simulation will eventually lead to their own displacement as decision makers. This fear is equally balanced by the belief that "machines" cannot make reliable forecasts in unexpected and emergency conditions and, therefore, such data are unacceptable in the reality of the disaster.

Let us take these, one by one, and see if we can build the necessary parameters to provide a Computer Simulation Model for Emergency Response that will:

- Maximize Effective Use of Resources
- Provide Information for Decision-making
- Provide Training for Emergency Managers by Simulating Emergencies

The Quality of the UNEXPECTED in Emergency Response Simulation

We shall have to change the unacceptable emergency factor of "the unexpected" into the simulator's "probability" factor. And, here, it may be well to requote Bertrand Russell, at least apocryphally:

> "Probability is the most important concept in modern science, especially since nobody has the slightest notion what it means."

Certainly, the probability of an emergency happening somewhere in the next few minutes is high. That it will happen in your vicinity in these next few minutes is low. That it will be an emergency of sufficient size to profit from increased maximization of effective resources is lower still. But, when it does happen (and it will), the cost in lives and property lost becomes enormously high--projected to 17 BILLION, for example, if Los Angeles suffers a 7.5 earthquake on the Newport Englewood fault during business hours.

Statistical Scarcity of Large Multi-agency Emergency Response Incidents

If it is true that one of the primary difficulties of simulation is "too many variable factors and too few runs," then the same fault lies in the occurrence (or lack thereof) of large, multi-agency emergencies, requiring a sophisticated degree of command and control. While these large emergencies seem to be on the increase (i.e., the aircrashes in the Potomac, in Boston, in Kenner, Louisiana, and the spate of devastating high-rise fires in our urban office buildings and luxury hotels), we still lack sufficient numbers to make statistics the first approach in this simulation model. In fact, human behavior is heavily involved in these multi-agency operations and, as such, the statistical structure may be the last and least of the considerations in designing this Computer Simulation Model.

ACCEPTANCE OF THE COMPUTER SIMULATION MODEL BY EMERGENCY DECISION MAKERS

Here, we come to the meat of our problem. Before our Computer Simulation Model will have credibility, we must determine absolutely Who's in Charge?. I would like to take you on a philosophical path to explore why this question continues to lack a definitive answer.

WHO'S IN CHARGE?

In spite of man's universal bent toward structuring all things for all people, the puzzle of Who's in Charge? continues to perpetuate itself in emergency response.

Both business and military organizations have decision-making positions for which experience and length of service are essential prerequisites. Political office, however, has a completely different set of criteria. And, elected officials of local, state, and federal governments are, by law, responsible for the protection of life and property. In the last analysis, it is the mayor, the governor, and the President of the United States who must make the ultimate emergency decisions in times of greatest need. Obviously, politicians do not make these emergency decisions in a vacuum. They look to their emergency staff--Fire Chiefs, Commissioners of the State Police, Secretaries of State. Whoever. . . This is where the question "Who's in Charge?" becomes fuzzy.

Obviously, the person in the top decision-making spot will listen to his most trusted advisor. However, this may not be the person designated to assume operational command under the paper plan. Top aides and lieutenants may jockey for position and control. Or, on the other hand, they may abdicate their preplanned roles in the face of unaccustomed stress. Initially, in large multi-agency emergencies, there can be a great reluctance to assume command. This reflects a desire to avoid conflict over jurisdiction, as well as a reluctance to make tough decisions in such public view.

"Turf" becomes increasingly a matter of conflict as the emergency progresses. Then, as more information becomes available and the initial stress of the operation begins to ease, interagency rivalries become a factor in overall command and control. But, at the outset of the emergency and in that early time when the scope of the event remains unknown, there is often a lack of, rather than too much, leadership.

In this vacuum, there often appears some person who assumes the leadership role on an ad hoc basis. It usually takes 48 to 72 hours before this occurs, which seriously delays the maximization of rescue and recovery efforts. Sometimes this ad hoc person, who assumes authority outside the chain of command, may be untrained for the role. In fact, this action-oriented person may not "practice" and, therefore, may be lacking in some of the training and technical information so necessary in an emergency.

This inexperience in actual emergencies, under stressful conditions, is one of the most important reasons for the failure of leadership. The players in the public arena, whether politically elected or appointed, have had little or no chance to actually experience a severe emergency. True, they have been "prepared" with paper plans and lines of authority. But, in times of stress, the execution of these plans has shown a tendency to fail.

A Computer Simulation Model, appropriate for the training of predesignated responsible officials, could remove this significant reason for ad hoc chains of command that presently develop during large scale civil emergencies.

There is still another facet of the Who's in Charge? puzzle that will further complicate the work of the simulator who is devising this computer assisted model. It is the temperament of those persons in the civilian, bureaucratic organizations who are "in charge." Generally, these are "Type A" personalities, highly motivated toward personal success, and feeling most comfortable in their everyday place, in their normal surroundings. They tend to be left-brained, right-handed, linear thinkers, comfortable with both the written and spoken word. But, in times of emergency, "Type B" personalities, the spatial thinkers, tend to rise to the top. These spatial thinkers are most comfortable with action and with the tools of action. By nature, Type B personalities tend not to "practice," but to step forward in an emergency to fill the vacuum left by an inappropriate match between the temperament that spelled success to the titular role during non-emergency times, rather than to the needs and stress of the disaster.

CONCLUSION

Admittedly, some broad generalities have been used here. Not all successful leaders are right-handed Type A's, and not all authorities are in agreement over the importance of the left-brained, right-brained theory. However, there is no denying the continual and recurrent problem of the lack of identifiable command and authority in emergency operations, by civilians, in the United States today. Regardless of the reasons behind this ambiguity, it remains a very real deterrent to the best use of scarce resources in the early hours of the emergency. And, I believe that, regardless of the reason for this ambiguity, repeated exposure to the Computer Simulation Model will do much to remove the distress and inexperience associated with leadership roles during emergencies.

In the military, officers' training courses have attempted to train their action-oriented group to be planners and to develop the bilateral use of both the left and right brains. Now, the military has discovered Computer Simulation Model Systems and is taking a lead in their application to military strategy, tactics and training. C^3I, standing for Command, Control, Communications and Intelligence, is the military's designation for this state-of-the-art effort. It is interesting that their acronym, C^3I, has used the designation "intelligence," as opposed to "information." It is of great importance at this stage of acceptance by the business and bureaucratic communities, that Computer Simulation Systems be made as nonthreatening as possible. Some users still fear that the machine, with its data and memory banks, will eventually replace them as leaders and decision makers. But, the Computer Simulation still remains a source of information only. It is necessary for the brain of man to turn this information into intelligence and apply it toward the solution of the emergency.

Now we have an intriguing possibility, a mix between the spatially oriented, action-type leader and the linear software of the computer. Spatial leaders are lacking in their linear thought processes and in their written and spoken modes. They can now have the linear software of the spatially operated computer information bank at their fingertips. This has noteworthy possibilities. In Sagan's writings on the brain, it was felt that those essentially ambidextrous persons, with fully actualized, equal use of both the right and left brains, were the ultimate choice as leaders in times of great emergenc--General George Marshall in WW II would be an example. It is possible that we will begin to see a new type of leadership developing in the Age of Electronic Information. Action-oriented personalities can now use the computer to augment those linear processes of thought and organization possibly denied them by their spatial, right-brain orientation.

The ultimate goal of the Computer Simulation for Emergencies is to enable emergency managers to maximize the use of information and resources, so as to reduce the impact of a disaster on their communities.

The computer simulation model can do this by:

- Processing the plethora of information regarding the emergency into an organized, accessible format.
- Providing checklists and "decision-tree" reminders to managers operating under stress.
- Providing lists of resources, easily called up at a touch to the computer.
- Providing an instantly available, comprehensive map of the disaster, showing updated locations of the continuously inputted information.
- Providing a series of scenarios for the training of disaster managers.

Having solved the question of Who's In Charge?, the simulation can become a reality for emergency management, providing dramatic improvement in its direction and control systems. The Age of Information has provided us with the tools, and with the opportunity to gain a degree of control over our modern emergencies.

The initial modeling of these Computer Simulations for Emergencies will be difficult due to the relative lack of sophistication in present disaster management processes. However, use of the computer should rapidly advance the state-of-the-art of emergency management. I would expect the second generation of simulator modeling to permit a breakthrough in the reduction of loss of life and property. This would be due to increased effective management, made possible through experiences provided by the first generation training scenarios. This training would be enhanced by the increasing reliance upon the chains of command for the direction and control processes, as this structure has become more reliable and more expert. I would also expect more appreciation for the possibility of effective control and consequent reduction in the size and cost of emergencies due to this computerized enhancement of management skills.

During the last two decades, the effective management of wildfires has improved so as to dramatically decrease their destruction of the valuable timber resources of this country. So, too, can the Computer Simulation for Emergencies now bring a quantum improvement in other types of disaster management in the coming Age of Information. Disasters were previously considered "Acts of God" and, as such, could not be defended against their impact. But, today, most of our large scale emergencies are acts of man. They are urban and arson fires, airport tragedies, toxic chemical spills, and the like. Certainly, the aggregate costs of these emergencies to their communities must be contained and reduced. Computer Simulation Modeling can start us quickly toward this goal.

Mr. McMANIS. Jacques and I have divvied up the presentation. I really would like Jacques to talk for a few minutes about the issues that were raised in trying to discuss the problem of simulation, to even understand the problem of simulation.

Our group worked in a rather classic team-building fashion, starting off with a period of fencing and trying to establish the boundaries of the language; followed up by a period of belligerency where we really got into some good discussions and perhaps disagreements, and then finishing up on what is normally and, hopefully, the note of most team-building exercises, a very closely alined set of recommendations in which we all believe very strongly.

So, Jacques, perhaps you can talk a little bit about how we approached the simulation problem.

Mr. VALLEE. Mr. Chairman, it is difficult to do justice to the range of issues that we considered, especially the belligerency part of our discussion. But we have tried to summarize some of the issues that came before the group.

We looked at different types of useful simulations—and simulations can range all over the map from purely manual exercises, possibly based on machine data; man-machine interactive exercises; and pure machine exercises that can be used for training, for modeling, and for management decision modeling.

The previous speakers mentioned the use of simulation to aid decision support. That was a theme that recurred throughout our discussions.

Another theme that recurred throughout the discussion was the role of the technology and, like the previous group, we found that technology, hardware, and software could be deemphasized, that people were the most important resource.

The major issue that emerged from that was access to people and access to the competence and the data that people understood.

The motivations to build a simulation have to do with developing planning tools; exercising plans; controlling the effectiveness of a plan; and placing people under unusual conditions with different operating requirements.

The guidelines that emerged from the group had to do with allowing for flexibility; allowing for alternative solutions to an emergency; assembling all pertinent data bases, and including graphic and spatial representation for human use.

In doing this, I do not think we should underestimate the obstacles that you have to overcome. The obstacles have to do not so much with the technology. Again, the technology is perhaps a crucial part of all this, but the major obstacles are the fears of exposing lack of data; in some cases exposing incompetence or giving away information that people tend to retain. I think Tom Belden had touched on that in his first presentation before you.

Who should be in charge? What leadership structure are we supporting? Are we in danger of developing a system that will be very static and will get in the way of a dynamic reexamination of decision structures?

The goals are access to information. One of our members said, "crosswalk to having enhanced access to knowledge and to data" which currently is not very well satisfied. Again, we came to the

conclusion, one of our conclusions is a need for some sort of center or clearinghouse.

Some of our other concerns had to do with the fact that simulations can be fairly trivial if applied purely to a physical system. But their best role is in serving as a bridge, as a mode of communication, among people with different value systems and people with access to different sources of data.

Mr. McMANIS. We have, I think, rather simple conclusions which again are very much in line with the previous group's. If we can change the foil, please.

The requirement that we ended up focusing on, which was very pleasing to me but I have to say that I did not force at all or even bring up, was that really the requirement in the emergency management arena is to be able to provide adequate early warning. That is, warning which occurs at the time of the flood or the disaster really is no warning at all.

We need to, as Dino Brugioni noted yesterday, take advantage of our opportunities to detect the threats early enough to be able to mitigate those threats.

We were fortunate to have Dino with us today to talk more about that particular problem because indeed, I think here Dino has noted a threat which I would certainly hope that people do take note of and do act against.

There are four generic actions which we see need to be taken, and I have to say that these do range somewhat afar from perhaps just the pure simulation activities.

The first of our concerns was that we do see ambiguity in the responsibilities, particularly in terms of warning. Who really has the responsibilities for warning in terms of emergency situations—particularly in the natural emergency situations. We did not explore this perhaps as much as we would have liked, but we found a confusion in the roles between FEMA, Weather Service, NOAA, and other participants, as one example.

We talked a great deal in our session about the need for adequate information support as opposed to perhaps pure simulation. We really had trouble getting away from that, and I think there is a good reason for that. We all recognize that information resources in the Federal Government and also at the State level are extensive. But the ability to get to that information, to make it accessible to our colleagues in San Diego or in Gatlinburg, is very difficult.

So, we too recommend that there be a clearinghouse for two different things.

One, for the information itself, a place where people in the hinterlands can go to ask the question, find out where the data resides, and have assistance in getting that data.

The other part of the clearinghouse responsibility we see as one of trying to provide an avenue to access the technology and, perhaps most importantly, to access the expertise that resides throughout the Government, throughout academia, and throughout the private sector.

We also believe that there perhaps is a problem in the statement of priorities. We tossed around some very rough figures, budgetary figures, in terms of emergency management. I will not attest to

their accuracy but I do not think they are too far off. We see greater than 80 percent of the emergency management budget focused against such things as nuclear conflict and nuclear incidents.

The group was unanimous in noting, however, that perhaps greater than 80 percent of our true emergency management situations are really in the natural hazard area and most of those dealing with weather situations. We see a great imbalance here, therefore, between the way the budget is being levied against what we think are some of the real problems.

Now, to mitigate that a little bit, we do note that much of these dollars are being spent against this gross category of continuity of government and, indeed, efforts are under way at FEMA and elsewhere in terms of communications, and simulation capabilities, which will have eventual fallout into other areas. So, we do not want to make this as a total black-and-white case.

But we do feel very strongly that stronger efforts do need to be placed against the natural hazards.

Finally, we see the need for a high-level champion. I think this committee, if there has been one any place, has provided that. I use the term, which Jacques cleaned up, "Big Daddy" because a big daddy both kicks in the tail and pats on the head as appropriate.

But there really needs to be a focus for, I think, particularly FEMA activities but other activities in the emergency management area, someone who can really champion the cause and really work, say, particularly this natural hazard area. I think that is very critical.

So, these were essentially the recommendations that we came across. We did spend a lot of time talking about the role of simulation, as Jacques indicated. I want to stress one of the critical areas which we have all seen the need for, and that is the training area in its broadest sense. This is an area where we think that simulation can indeed play a very great role.

As just one final addendum I really would like to make one little addition to the comments of Dr. Tom Belden yesterday. I worked with Tom for most of my career, and indeed we worked together in developing the conferencing that he talked about, the conferencing capabilities.

I want to update the subcommittee on what has happened because I think it is very pertinent.

In my role today, I am the organizer or the chair of something we call the Washington Area Operations Centers Conference, which really is the thing that grew out of Tom's activities a number of years ago when I was indeed myself running information centers with Vince Heyman.

We have expanded the group beyond the classic national security players. Ten years ago, we were talking about, I think, the the "Big Six" players of the National Military Command Center, National Military Indication Center, the CIA Operations Center, the State Operations Center, and INR, NSA Command Center, and the White House Situation Room.

We have since, about 5 years ago we added the Services as participants in the conferencing network and today have invited as part of the conference other players such as Commerce, Treasury

and FEMA is about to join our conference. I suspect we will see the Federal Bureau of Investigation aboard as well.

This may be one of the few places where the intelligence community and the civil agencies really get together to exchange information. The nature of some of our emergencies today—terrorism being a very specific example—is such that it really is driving our community closer and closer together, realizing that we do get in some legal problems in terms of foreign intelligence.

But things are continuing to evolve and I think that will be very useful.

Jacques, do you have anything else to add?

Mr. VALLEE. No.

Mr. MCMANIS. Thank you, Mr. Chairman.

Mr. GORE. Thank you. That is, again, extremely valuable and we appreciate your recommendations.

In light of the fact that we have four other reports to be made, I am going to be rather sparse with my questions because I know that all of the participants in other working groups are interested in the summaries of all six working groups. So, we are going to proceed with them.

I want to thank you very much for your special contribution and thanks to all members of your working group. Thank you very much.

Mr. MCMANIS. Thank you. It is our pleasure.

Mr. GORE. Let me call next the group leader and rapporteur for group III, the analyst workstation utilization group. The group leader is Curtis L. Fritz with the DIDS Company in Washington, and Ashley Holmes, Manager of Emergency Information and Coordination Center with FEMA. Of course, Ash Holmes was with us yesterday as well.

I want to welcome you back to the witness table and, Mr. Fritz, we appreciate your time here and appreciate the opportunity I have had to work with you. Please, proceed with your presentation.

STATEMENT OF CURTIS L. FRITZ, DIDS CO.; ACCOMPANIED BY ASHLEY HOLMES, MANAGER, EMERGENCY INFORMATION AND COORDINATION CENTER, FEDERAL EMERGENCY MANAGEMENT AGENCY

Mr. FRITZ. Mr. Chairman, working group III had fun. I know you would have, too, if you had been with us because I know you like to get into those issues. When you talk about work stations, you are talking about some concrete things. Not that you necessarily agree on them, but at least they are concrete.

We had a small group. In the group were two from private industry actually selling work stations; we had four from private industry who are providing consultative support to emergency managers, and we had actually three emergency managers. I guess if we define that, two from FEMA and one from local. We sort of missed the middle-state level. We would have liked to have had somebody from there. But anyway, we had the spectrum and we had about six support analysts from other Federal agencies who are not designated as emergency managers but who are drawn on and who have work stations, who are drawn on in emergency situations.

Mr. GORE. Without objection, we will put all of their names in the record.

Mr. FRITZ. Thank you.

[Material to be supplied follows:]

Group III - Analyst workstation utilization - alternatives in human training and roles, file creation and use, and network access.

Group Leader: Mr. Curtis L. Fritz
President
DIDS-Co.

Rapporteur: Mr. Ashley W. Holmes
Manager, Emergency Information & Coordination Center
Federal Emergency Management Agency

Participants

Dr. Marilyn Bracken
Environmental Testing & Certification Corporation
Chevy Chase, Md.

Dr. Robert A. Clark
Director, Office of Hydrology
National Weather Service

Mr. Richard I. Coleman
Acting Chief, Severe Weather Branch
National Weather Service

Dr. Jerome E. Dobson
Geographer
University of Arizona
Tempe, Arizona

Mr. Robert Fetter
Chief, Computer Operations Branch
Federal Emergency Management Agency

Mr. A. Deon Harris
Director
Bannock County Department of Emergency Services
Pocatello, Idaho

Dr. Joel Morrison
Senior Advisor for Geography
U.S. Geological Survey

Mr. Terry R. Savcage
Manager, Advanced Development
TRW, Inc.

Mr. Stanley R. Schneider
National Environmental Satellite, Data and Information Services
NOAA

Mr. Stephen R. Tripp
Bethesda, Maryland

Mr. FRITZ. We had four presentations that were examples of data and work stations and, by the way, when we talked about work stations we very quickly fell into the substantive data aspects which communications and other discussions of emergency management do not seem to do.

But, what is the information that we are to deal with? We come to it very quickly if you talk about work stations. So, we had four presentations and I want to give you a little bit of what they presented and then show a few excerpts, slide excerpts, from those four presentations of data and work-station examples, and then itemize for you the dozen conclusions we came to and the five recommendations we came to—not without controversy and not unanimously, but consensus.

The first presentation was by NOAA which produces a lot of the images that you saw yesterday. In fact from satellite surveillance they have 10 categories of watch. They watch floods, and hurricanes, and ice storms, and killer frosts, and tornados, and drought, and thermal pollution, and volcanos, and search and rescue, and fires. So, they have analysts all the time receiving data from these sensors into their work stations which are really image analysis work stations and they are interactive, high speed, color decision-making support, and product work stations.

Mr. GORE. This looks like part of the wall to me. [Laughter.]

Mr. FRITZ. It does, doesn't it?

This is one of their work stations and I will show you some others, and they may look a lot alike. Usually, behind this television tube on the left and the off-numeric terminal on the right which the analyst sits at, is a minicomputer or some kind of computer where the data is being messaged, and there may be a special graphics device generating that image.

We had a presentation by FEMA—believe it or not, this is a FEMA slide—and this is an exercise which they are going to actually use in training also. It is a series of slides that shows the development of this plume and you could, of course, try to overlay this with population or properties. Now you are talking about combining data sources which is a problem—one of the few actual technical problems, R&D problems, that we surfaced. Otherwise technology, as the other groups have said, is here. We just have a hard time applying it.

This is another workstation that is actually monitoring floods in Jackson, Miss., I believe, courtesy of Forms and Substance, Inc.—what a name, Forms and Substance. Anyway, I like the substance part and the form is graphic. I hope that is coming through now, too, that these work stations except in one case which I will tell you about, graphics was the mode of the day.

I think that is what is getting us on the Bill Baker question of, how do you get from 1 billion bits a second down to the human capacity of 40 bits a second. It is not through words or numbers, I can tell you, it is going to be through pictures. It is going to be more than 40. It will not be 1 billion but it will be more than 40 and we will start closing that gap.

So, graphics is the order of the day—not universally. For example, this is another one, the same source. Only this is—sorry, I have forgotten—monitoring a chemical spill, I believe, the work

station. So, again you see the interactive terminal on the right which has some floppies in it, and then your display station on the left. That is typical of a work station. Behind there is no doubt a general-purpose processor of either mini or micro level.

Before I go farther, FEMA also has a work station that is a group work station. I have an overhead transparancy which, if we have time, I will show you, which is the layout of the new facility for the Emergency Information and Coordination Center. They have established 50 individual work stations and a general work station which is a group workstation which has large-screen projection but the same kind of interactive graphic capability for executive group analysis of the data.

This is graphics out of the Washington Post. I think you will agree that color graphics help when you see the United States today, weather map. You know what is hot and what is cold without reading anything, and if you are traveling you know whether to take your overcoat or not at a glance. A beautiful use of color graphics.

Business graphics, which has become so popular and now there are a dozen high-quality commercial desk top sets that anybody can buy, and it is interactive for the analyst or the executive to sit at, put in his data set and make a line chart of trends, or bar-graph apportioning resources, or comparing resources. But you are talking about small data sets, maybe a dozen figures; maybe 50 figures maximum.

I made a short presentation on the decision information display system which I know the chairman is familiar with. In fact, he has been on the keyboard one time some years ago. But it is new to a lot of people. I am surprised how many people in our group had at least heard of it and some had had a demonstration. But its objective was to take dense data sets such as the value of the population increase for all 3,081 counties in the United States and present it very rapidly, interactively, for comprehension of where was the population growth in the last 10 years or the last year, or where is it projected for next year; whatever your analytical question is.

So, in this one you can see by county. If you read the scale on the right, the white counties were those that had little or no growth, on up to the pink counties which had the highest percentage growth. You are not surprised to see Florida and Arizona, and the Sun belt. But, did you know about the Upper Peninsula of Michigan? Would that have popped out at you from a table of values, from a computer printout? I do not think so because if it is listed alphabetically or something else, it does not show up the juxtaposition. So, that is the work station for DIDS. Behind it is a WAX computer, again in the similar setup that I mentioned before.

Alternatively, because of the high cost of the so-called very available broad-band communications, we had to develop a smart remote terminal system for those that could not have a mainframe computer next door. So, this is based on an LSI processor and it has the cartography stored locally and you can operate it in an independent mode or you can connect to a main frame for data retrieval.

This fits in with something that FEMA is planning anyway in terms of long-range development of the levels of equipment and

work stations, and data files from the Federal on down to the State, to the local—well, first through their regional offices.

At the right you see a camera which can handle full color. You can zoom in to the Chesapeake Bay area in terms of population increase and look at the individual areas in a matter of seconds, which is the object in which speed was brought out from the working group No. I as necessary. You can use color to highlight things. This is the same data set but we have changed the colors and now, if you look at the dark blue stripe down the middle of the country, you wonder what that is with the high population loss, and you realize that is the Mississippi River. Those counties adjoining the Mississippi River had a loss, much less, just below the average increase for the country. They had a loss of population during that 10-year period.

The point is, it pops out at you. It does not give you all the answers, it does not tell you why—whether it is floods or whether it is something else. But at least things come out at you and that is what we are talking about, an analyst's work station where we use technology to help assimilate the data.

Again, you can zoom in. You can put in projections. This is population protected by river basin rather than a geopolitical boundary. That was done by USGS in a water availability survey, along with these current data.

I am going to flip through very fast now, just to give you an idea, the range of data that we are talking about. You have an individual State by county. Overlaid on this is the congressional district boundaries and congressional district numbers. These are geopolitical presentations—there is a familiar outline. This is Tennessee, again, with the congressional district boundaries overlaid.

This is zooming in on downtown Detroit to see where the blue-collar workers live. Now you are plotting data by census tract which is a group of about 4,000 residents and therefore changes in size. Again, you can change the scale. You can change the color scheme.

You can zoom in closer. This is the actual number of employed professionals and technical people by congressional district across the country for all 435. So, those in green have the highest number of professional and technical people. So, it is a human resource kind of presentation of data.

Where do the aged live, the aging I think is a better word—now that I am getting close—age 65 and up. The significant difference you will see from the bottom scale because this is the ratio of the population that are over age 65. In the bottom one you are talking about less than 10 percent. In the top category you are talking up to 34 percent in some countries, of people over 65. So, it is significant.

I am showing this one so that you can see that you can correlate data. This is the number of elderly people living at what altitudes. Is there a correlation between age and elevation, of all things?

This is health resources and utilization, which would certainly be appropriate in an emergency management, certainly a preparedness-type study.

There are many more but I am going to stop now because I want to make sure I get to the conclusions and recommendations for

you. If we have time, or if anybody else wants to stay after the session and see more of these kinds of things, I will be glad to do that.

The conclusions that we came to were—believe it or not—we think work stations are a good thing. We had a hard time deciding what a work station was, namely because it is a new buzzword and essentially it is in the organized place of activity for a person and implies computer support or electronic support.

But there are—the second conclusion—many types, and levels, and functions and you cannot generalize and say: "Here is the magic emergency management work station, everybody buy it," that is not going to happen.

No. 3 is, there are no technical problems in the sense of hardware or software technology. We have problems of application. We agreed that the State and local levels are the focal point for action, and that the Federal—conclusion 5 is that the Federal is to support the State and local.

Now, this is important because we are talking about who is going to have what data where, and the Federal is responsible for, of course, any cross-jurisdictional activities and for coordination of the Federal participation in emergency management.

We concluded that the locals are not getting all of the FEMA support that they think they need and deserve, either because of limited resources in FEMA or possibly because the locals have not really articulated what it is they need.

Seven is that there is a need for training, specifically in the area of multisensor data use.

The eighth conclusion is sort of research and development needs. One is, we need mostly an awareness of what technology is available. We need some research on the data integration, particularly from the software because the present data-base management systems are not adequate. We need display integration of sensory information from multisources. We cannot put geopolitical type data we just saw into imagery data in the same image, but maybe we could, you know, partition the screen and put one of each type in the same screen as the next step.

Networking in the sense of file migration levels of data resident.

Conclusion 9 is, we do not know what the local levels need in terms of information and technical capabilities, and we do not know what is available—"we" being the information management community as a whole.

Conclusion 11 is that data is the key, that it would be a big mistake to rely on a single source like aerial reconnaissance. We must exploit all sources, and it would be an even greater mistake to rely on a single agency for full responsibility. But we must draw on all the resources. We were so impressed with how many resources are in NOAA and USGS, and the Weather Bureau, and FAA, communications all over and locally.

Five recommendations, we came down to:

One is that FEMA be authorized and charged with an information support and coordination function, and of course commensurate resources to do that.

By information support we are talking in terms of technique. It could be research, but it could be convening panels that could be conducting surveys, or requirement surveys, or doing a referral

service for technology or data availability, those kinds of information support activities—not become a master information holder at all.

Two is that FEMA should have an inhouse capability for utilizing the multisensor capabilities that exist.

Three is that FEMA should develop and provide multisensor data appreciation training for emergency managers at all levels of the emergency management community.

Four—there was not complete agreement on this—that FEMA should develop a set of application program packages, emergency management application programs, for micro processors because that is what we see out at the local level. We do not see private industry developing this, evidently because there is not sufficient market, and we would like to see this done as a common service and demonstrated, perhaps, through the National Association of Local Emergency Managers.

Last, the fifth recommendation is that State and local emergency managers should make greater use of the State university remote sensing analysis resources because we do not see, because of the cost, every local area having those kinds of capabilities that universities do have.

Those were our conclusions and recommendations. It was a good group, as I said. We spent 6 hours, we could have easily spent 6 days.

Thank you.

Mr. GORE. Excellent, very good.

Mr. Holmes, do you want to add anything?

Mr. HOLMES. No, sir. No; thank you, I do not.

Mr. GORE. All right, very good. That is an excellent set of recommendations and again, we will take them carefully into account in considering followup legislative action.

We have another vote on the floor. I hate that our session is interrupted this way. But with your indulgence, again, we will recess for about 8 minutes and when we come back we will hear from group No. IV, the emergency operations center capabilities group, Vincent Heyman and Guy Daines. We will do that immediately upon returning.

Mr. Fritz, Mr. Holmes, thank you very much.

Mr. FRITZ. Thank you, Mr. Chairman.

[Recess.]

Mr. GORE. The subcommittee will come back to order. Again, I apologize for the frequent interruptions on the floor. It is that time of year.

I would like to call to the witness table Vincent J. Heyman, senior associate with the Policy Sciences Division of the Planning Research Corporation in Arlington, and Guy E. Daines, Director of Emergency Management Administration in Clearwater, Fla.

I would like to welcome you both and thank you and members of your group for the work that you have done. Without objection, we will include the names of your group members in the record at this point and, Mr. Heyman, we would look forward to your statement.

[Material to be supplied follows:]

Group IV - Emergency operations center capabilities (on-going and during crises) -- facilities, files, procedures, staffing (incl. use of outside experts).

Group Leader: Mr. Vincent J. Heyman
Senior Associate
Planning Research Corp.

Rapporteur: Mr. Guy E. Daines
Director, Emergency Management Administration
Pinellas County, Florida

Participants

Mr. Charles K. Allen
Director of Public Affairs & Safety
Plainfield, N.J.

Mr. Thomas E. Burns
Mitre Corporation
McLean, Virginia

Mr. Timothy R.S. Campbell
Director of Emergency Services
Chester County, Pa.

Dr. Russell Dynes
Chairperson in Sociology
University of Delaware

Ms. Carol Eberhard
Research Assistant
CRS
Library of Congress

Mr. Robert Fletcher
Chief of Emergency Operations Section
U.S. Army Corps of Engineers

Mr. Charles Fritz
Mitre Corp.
McLean, Virginia

Mr. Selby Jacobs
Coordinator of Emergency Services
Prince William County, Md.

Dr. Arch Johnston
Director, Tennessee Earthquake Information Center
Memphis State University

Dr. Edward W. Lawless
Midwest Research Institute
Kansas City, Missouri

Dr. Mary Lydstad
Chief, Center for Mental Health Studies of Emergencies
Department of Health & Human Services

Mr. Norman S. McTague
Operations Director
Virginia Office of Emergency & Energy Services
Richmond, Va.

Mr. Mike Pilgrim
BDM Corporation
McLean, Va.

Dr. E.L. Quarantelli
Director, Disaster Research Center
Ohio State University

Mr. Roger W. Reinke
National Telecommunications & Information Administration
Department of Commerce

Mr. Robert Rosenberry
Deputy Director, Emergency Management & Sharing
Veterans Administration

Mr. Clement Shearer
U.S. Geological Survey
Reston, Va.

Mr. Daniel J. Shearin, Sr.
Senior Systems Analyst
Armament Systems, Inc.
Aberdeen, Md.

Mr. R. Hal Silvers
Director, Office of Emergency Preparedness
Prince Georges County, Md.

Mr. Peppino N. Vlannes
Vlannes Associates, Inc.
Fairfax, Va.

STATEMENT OF VINCENT J. HEYMAN, SENIOR ASSOCIATE, POLICY SCIENCES DIVISION, PLANNING RESEARCH CORPORATION, ACCOMPANIED BY TIMOTHY CAMPBELL, DIRECTOR OF EMERGENCY SERVICES FOR CHESTER COUNTY, PA.

Mr. HEYMAN. Thank you, Mr. Chairman.

I would like to note for the record that Mr. Daines was unavoidably detained elsewhere.

Mr. GORE. Oh, I am sorry.

Mr. HEYMAN. Mr. Timothy Campbell, who is the director of emergency services for Chester County, Pa., will sit in his stead.

Mr. GORE. I was not looking up.

Mr. HEYMAN. I switched on you. [Laughter.]

Before getting into the substance, I wanted to make a few opening remarks as to the relevance of my presence here. The fact that I am with the Planning Research Corp. is essentially irrelevant. What is relevant is that for 5 years I was the Director of the CIA Operations Center in Langley, Va., and am a member of the Belden and McManis "Old Boy" network as Dave mentio ed earlier. [Laughter.]

Thus, though I commented from a national point of view, however, it is my judgment that the problems at the national level have some relevance at the local level.

I was very fortunate—we were very fortunate—in having among us at least seven or eight local, State, and municipal people who were involved in this, on the subject of building and functioning an emergency operations center. And I must thank the chairman and the group for having provided that kind of expertise. It was an outstanding group, and it was tough to get the floor, but that's the way it should be.

The issue of the identification of what is an operational center and what it does, is not very clear in most minds, even at the national level, because it's supposed to shortcut the bureaucratic process. And if there's anything that's omnipresent in our society, it is the bureaucratic process.

So the development of this instrumentality for shortcut and combination is only about 15 or 20 years old, and has resulted really from breakdown of traditional structures. In the intelligence business, it was the failure of the intelligence processes to work in things like the Pueblo incident, the Yom Kippur War, in Korea, and most particularly in Mayaguez. As a result of these lessons, it was recognized that there was a need to compress the timeframe when one made a response to these kinds of crises.

This approach was resisted by traditionalists, and I think it is resisted by traditionalists at the local level. The issue of great guard turf is ever-present in our society, and particularly so when you are trying to build something new.

The charter of our group was to deal essentially with technology, although we found that the behavioral as well as the technical problems, when added to the bureaucratic issues, were at least as important as the issue of technology. However, I think it is important to state that the essential technologies needed in an operational center are, of course, your omnipresent phones and some way of handling two-way messages to and from the places of action.

At the national level things are in a fairly good state. At the local level I think there is a great deal of need for improvement, both from my personal observation, as well as through the discussions we had in the last day and a half.

One thing that I find lacking particularly is the issue of training and planning. And we can get into that a little later. And I have asked Mr. Campbell to be prepared to discuss, very briefly at the end, his perception of these kinds of problems at the local level, where most of the Americans live, where they are ill-informed on what the national issues are in terms of disasters. And they need leadership and help, and these gentlemen at that level are dealing with a very difficult problem.

The human dimension in an EOC is also a relatively new function. I think the development of FEMA is a national example of that. That has taken us quite a while to develop, a civilian agency that can be a coordinator or rapporteur on things of an emergency disaster nature. I think their difficulties down through the years of getting going were a lack of priority and a lack of recognition that the quality of the people can determine the quality of your product. And I think there is a great change in that in the last years, and we are all happy to see that.

The essential point that humans provide in an operational center, to paraphrase Tom Belden, is to act as a corporate memory: They have to know who the people are, who know what, at what point in time, because you simply can't start doing that when the emergency hits you.

Unfortunately, the urgency of this kind of business takes its toll at the national level, and we have had extreme difficulty with maintaining the energy level and that kind of thing during recurring crisis.

But the point I am making is that no amount of technology can make up for the inadequacies of training, quality, motivation, and energized leadership.

One other issue that I had briefly mentioned earlier, and I would like to go to again and go over briefly, is the problem of subculture interaction. In Washington at the national level we have at least six subcultures who operate in an emergency operations center; military, intelligence, domestic policy, congressional, to name the major players. They sometimes talk different languages. They sometimes have different Coms. They sometimes have different perceptions of the importance of a particular issue.

I believe that that problem of multilevel jurisdictions and different perceptions exists also at the local level, and it is one of the major items that we discussed this morning and yesterday afternoon.

During the discussions with the group, we were asked to address several questions that the committee provided us, as to what kinds of things an operational center might have. I will briefly mention these questions, since some of them are extremely relevant, some of them not so.

The question of multiple crises, there was a split on that. Most people felt that they could handle them, although, given the inadequacy of Coms at certain places, there was not unanimity on that.

What kinds of capabilities should exist in an emergency operations center that would provide linkage with external sources? That again was not universally accepted, because what we are talking about there is essentially telephones at the local level. At the national level that's a different story.

And our discussion pretty much broke down into those two things: What is the situation at the national level? What is the situation at the local level? And it became clear that we were coming up with two separate sets of recommendations because of the circumstances.

Ultimately, we came up with three or four observations that led to half dozen points for emphasis that we would recommend to the committee.

The workshop of this type I think should be continued. And I would love to see in the future that the representatives of FEMA take a more active part. Unfortunately, there was not a member of FEMA on our committee, and I think they would have provided an essential element because there are a lot of questions unanswered because of their absence.

Second, the issue of technology in an operational center environment is only part of the problem, and as I have mentioned, it is a problem that essentially involves telephones and communications elements.

The thing that we should try to avoid is getting involved in fancy data base manipulations systems until such time as we get at the basic problems, which are: Training, planning, and the establishment of a rapporteur system between the local level and the national level.

During the course of our discussion someone made the analogy that the FBI acts as all things to all people on crimes on which it can act as the coordinator between the national level and the local level.

Now, that may be a farfetched comparison, but what I think we are saying, particularly at the local level, is there needs to be someone operating in that context, or close to that context, that can be available for advice, particularly on training and planning and also for consultation as to how the local level interacts in terms of communications, in terms of logic, in terms of training with the national levels of our country.

The points for emphasis: At the national level there is a feeling that the role of FEMA was not terribly important because they had their act together, as it were, and that the contribution that FEMA might make would be slight as opposed to where, on the local level, it was considered to be vital.

They felt that the techniques existing at the national level were adequate, that what was missing was the existence of something we were calling the national emergency communications network. Now, there are many networks at the national level, and they can interconnect at various points in the spectrum. How that is done and whether it can be done in time is a question we were unable to answer at the committee. There may be legislation needed on this point.

We also discovered in talking to our Veterans' Administration representative that there is excellent cooperation between the Vet-

erans' Administration and the Department of Defense on emergency use of veterans hospitals and that kind of health care. We were very encouraged to hear that. And again we contrast it with the kinds of coordination body that seems to be needed to take care of the other elements at the local level.

Personnel at the national level are usually very good. Personnel at the local level are usually doing this as a second job. As someone pointed out, he takes off his overalls and he mans the telephones at a particular operational center because that's the best they can do.

Again back to the local side, the technology we are talking about there are phones. Phones are becoming increasingly expensive. Several counties have said that because of that problem they may have to cut back on the extent of their involvement in exercising training, which we have found to be a very crucial element. They have, unfortunately, low priorities for funds and attention with the political structure of their particular municipalities, whether it be at the county or State level, although we did find out that the State of Virginia is probably as well prepared as any group that we have seen or heard from. I observe, however, that being as close to Washington and having as many military establishments, they were probably more fortunate than most.

The training and motivation problem came up again and again and again. And we wish to emphasize that any future discussions or panels should perhaps get into that issue, which I believe, like the personnel, is often taken for granted.

Finally, what would the local communities, the local EOC's, expect from such a rapporteur if they were able to play the role that the FBI plays? Essentially, they would like a coordination role to be played by FEMA. They would like an education role to be played by FEMA. They would like an interaction role between the private sector, the universities, the companies, who are able to provide technological help and even training, since in many cases it is perceived as their civic duty to do so. I don't see that kind of interaction and leadership on the agenda, although it may well be there.

And just so that the local people can get their time, too, I have asked Mr. Campbell to make a few remarks from the Chester County viewpoint in Pennsylvania.

Mr. GORE. Very good.

Mr. Campbell.

Mr. CAMPBELL. Thank you, Mr. Chairman. I appreciate the opportunity to participate in the workshops, and I appreciate the opportunity to speak on behalf of all the local governments of the United States.

We see ourselves at the local government faced with an evolving agency in FEMA. We have many of the handicaps left over from previous initiatives, such as one which complicates the life of the gentleman I am replacing, Mr. Daines. He happens to live in one of the two most vulnerable hurricane counties in the United States, but under previous initiatives, since he is a risk county to nuclear attack, cannot receive Federal assistance for EOC funding.

The problem is that the initial initiative legislatively is the 1950 Civil Defense Act with its amendments of 1981, and we are seeing the fact that FEMA is in the process of implementing this dual-use

concept, which is one which has been in place in the United States' 50 components for many years.

In the State of Pennsylvania the civil defense networks were used for civilian emergencies beginning in 1950 under Governor Leader. At the national level, however, this is very recent.

And, what it has done is, it has left many of the county emergency management agencies with a lot of burdensome reporting that relates to the issue of enemy attack. And I am not putting down that as a disaster. However, I have had a lot of windstorms, and I have had a lot of floods, and I have not yet lived through a nuclear attack.

Unfortunately, most people do not realize that about 94 percent of what is needed for nuclear attack is needed for most civilian emergencies; and, dual-use is something that has existed at the local level for many years.

There are some hopeful signs, such as the IEMS strategy, that FEMA is beginning to appreciate this all-services approach that has been adopted by most of the counties and cities of the United States. A good example was Mr. Littlejohn's presentation yesterday.

What the counties can expect or wish from FEMA would vary by the 3,000-odd local directors. But, what I would expect to see is FEMA to help me to do my job in a more effective manner. I do not need assistance in buying technology. I need assistance in learning how to spend my money effectively. I do not want to waste $50,000 to learn that I bought the wrong package or the wrong hardware. And I would think that FEMA would be best spending its money on that kind of demonstration project and reporting it a little bit more effectively than publishing it in the NTIS catalog and expecting me to catch it there. [Laughter.]

Mr. CAMPBELL. Another area of concern is the Federal level, not only FEMA but most Federal agencies, have got to have a change in attitude. And that is the attitude that there is a massive government out there called "the local government" and that they are all the same and they are all equal. Unfortunately, the cities, counties, towns, boroughs, villages of the United States are not equal. They are not the same in resources, and they cannot do the same. A county of 9,000 cannot do the same as a township of 100,000, and we have that spread in America. And it should be realized at the Federal level.

FEMA's IMS concept may be the start to a true partnership. I hope it is. And I would suggest that they should be legislatively encouraged to continue with it because it is something that has worked at the State and county level for many years. I realize that not too many of my comments concern themselves with EOC's, but without some changes in attitude, you can have the most fantastic EOC in the world and it's not going to do any good. Thank you.

Mr. HEYMAN. That concludes our testimony.

Mr. GORE. Very good. Thank you very much for a wonderful contribution. And again, my thanks to the members of the group. Thank you.

The fifth group was on contingency capabilities. And I would like to call now the group leader, Lt. Col. Duane Adams, and the rapporteur, George H. Hicken, project manager of COINS at the Na-

tional Security Agency out at Fort Meade. And if you two could come to the witness table, I would like to welcome you. And without objection, we will put the names of everyone in your group in the record at this point.

[The material referred to follows:]

Group V - Contingency capabilities involving computers, telecommunications, and information technologies — esp. curtailed operating conditions.

Group Leader: Lt. Col. Duane A. Adams
Consultant
Arlington, Va.

Rapporteur: Mr. George H. Hicken
Project Manager COINS
National Security Agency

Participants

Mr. James Alexander
Inspector, Managerial Task Force
N.Y. City Emergency Medical Services

Ms. Ellen Albright
Program Director, Fire Safety & Emergency Management
Public Technology, Inc.

Cdr. Arcangelo Arecchi
USCG
Washington, D.C.

Dr. Louis Bransford
Vice President
Confertech
Arlington, Va.

Mr. Norman B. Douglas
NCS-EP-D
Washington, D.C.

Lt. Col. William W. Freitag
National Communication System
Washington, D.C.

Dr. Harold H. Organic
Director, Information Systems Development Service
Veterans Administration

Mr. Carl R. Palmer
Group Director, Information Management & Technology Division
General Accounting Office

Mr. Keith R. Peterson
Chief, Operations Division
Federal Emergency Management Agency

Mr. John Shaffer
Division Coordinator
Vermillion County Emergency Service & Disaster Agency
Danville, Illinois

Dr. T.C. Ting
Prof. & Head of Computer Sciences
Worcester Polytechnic Institute

Mr. Russell Young
Consultant
SRI International - Washington, D.C.

29-457 O—84——11

Mr. GORE. Colonel Adams, if you could begin, we are delighted to have you, and we look forward to your presentation.

STATEMENT OF LT. COL. DUANE A. ADAMS, ARLINGTON, VA., ACCOMPANIED BY GEORGE H. HICKEN, PROJECT MANAGER, COINS, NATIONAL SECURITY AGENCY, FORT MEADE, MD.

Colonel ADAMS. Thank you, Mr. Chairman.

Our first task was to try to define what we meant by "contingency capabilities." And at some level, you could think of it as everything going on in emergency management. What we had to do was first try to find the baseline in the information processing area; and then, when the baseline fails, then what do we have for backups? Well, that was what we started with, and then we went on to a number of other topics.

We had four presentations, including one from FEMA, one from the National Communications Systems, one from the New York City Emergency Medical Service, and one from the emergency manager for Vermillion County, Ill.

And what I would like to do is show a brief summary of what went on in those two, one from New York City and one from Vermillion County, and then after that make some observations.

Any time you have a short period of time and a small group of people, it is difficult to generalize too much. So although I will try to generalize some, I will have to base it on what we had in our particular workshop.

I might also note that typically the people that prepare reports and that come to a workshop like this are the better informed and have the better systems. So I would say that what we saw was not representative of what goes on at all county or city or even State levels. It is unfortunate that we didn't have anyone representing either the State or FEMA regional offices in our group. I think it would have contributed.

So if I could have the first slide, please.

[Slide.]

Colonel ADAMS. This just gives a brief summary of some of the things that were presented by Jim Alexander of the New York City Emergency Medical Service. And I indicate it only to show you the kinds of things that we have used as a starting point for our discussions. Interesting to note, first of all, the number of calls they make. They handle the ambulance services in the boroughs of New York City. And that number of 750,000 calls is a rather staggering number in some sense, when you look at what they have to respond to. And of those, some 850 are the multiple casualty incidents.

They do use computer systems. In fact, they have some fairly modern equipment with the DEC VAX equipment. And as we were looking at capabilities, we found out that they indeed have backup capabilities for power, emergency generators. They back up the computer system. They back up their data bases. And in the event that the 911 service goes out, they have got a backup capability to use both the radio and TV stations to alert people that 911 is out.

So this just gives you a brief indication of some of the capabilities that were presented by Mr. Alexander.

On the next chart——
[Slide.]

Colonel ADAMS [continuing]. There is sort of a brief summary that Mr. John Schafer, the emergency manager for Vermillion County, Ill., presented. Theirs is a countywide system that has a fairly extensive network of radio-telephone-landline communications. And they have got standby power. They have their own aircraft, their own weather radar system.

There is a case where someone has been very ingenious in terms of acquiring equipment and putting it to use, like spending $100 to buy an old truck and making it look like a very nice vehicle by the work they did to it.

They have just manual data bases. I think it was interesting to note that 40 percent of their work is with hazardous materials. And that included going into the high schools, for example, and discovering old chemicals that were dangerous and that were not either accounted for or the people didn't know that they even existed. They really started trying to categorize that and clean up on some of those old chemicals within the high schools.

Well, these were two presentations that we had. And what I would like to do now is go into the next chart and just make some general observations.

The first observation is that there is a marked disparity in the capabilities that are available at the different county and city levels. We saw the capabilities that New York City and Vermillion County in Illinois had, and I think they were generally very good. At some other extremes, even in Illinois we heard of others that didn't show up for a disaster in their county, and another instance where the people in charge of the county emergency management didn't even know about who their State EOC was.

So there is a tremendous disparity, and that is very strongly dependent on the people that are involved. You can have the right laws, the right structures, but if you don't have people that are serious about their jobs, it makes all the difference from having a success or just a mediocre activity.

There is one thing I think especially worth noting about the Vermillion County system. And that is that the State of Illinois has an Illinois Emergency Services and Disaster Act, which defines disasters and emergencies, identifies jurisdictions and responsibilities, and provides funding. And the funding is really a fairly critical issue because not only is it funding based on the population to help support their emergency management system, but also it covers liability for injury for people who are volunteers. And if they are injured while volunteering, their time is paid for while they are recovering. So it's a way to take the liability off some of the people who, in many cases, are volunteers for their work.

Another point that came out is that emergencies are managed at the lowest level. And we saw that in these two cases where, first of all, there was an effort to be self-sufficient. People wanted to have, in the case of Illinois, their own aircraft, their own weather radar, their own mobile units. They wanted to be self-sufficient, and they were fairly ingenious in acquiring the systems they needed.

Second, the particular groups, when you asked what about the contingencies, what if things don't work out right, they had taken,

in both cases, account of backup systems, backup power generators, backup of their data bases where they were automated. It was backup telecommunications systems.

Another observation to make is that these people are dealing with very limited budgets. And you don't realize how limited until you hear them say, we can't afford too much for computers. And you ask them, how much is too much; and they said, if it's over $1,000, that's too much. Well, a $1,000 computer says you're buying a home computer; you're going down to Radio Shack or Sears, you're buying what are just literally home computers, personal computers. And those are some of the systems that are being used to help manage at some of these local levels.

Another thing that came out was the level of automation. And I must admit I was very surprised to find that people were struggling to get personal computers, like Bob Littlejohn, who mentioned that he would like to get an IBM PC in his budget. You're talking about a $3,000 piece of equipment that is a major budget item.

When you compare the charts that were shown earlier by Mr. Fritz that showed the graphic capabilities, or you look at what the military is doing today with their Command and Control Systems and you compare that with the capabilities that are available at the local level, there is a tremendous gap. And when you look at what is available out of the current research community, when you look at things that come out of ARPA or the ideas of internetting or the use of natural language to make user interfaces easier, these people haven't even heard of those things much less have any form of them locally.

And there is little internetting or connecting the local resources with other resources. Then generally, they don't use the various kinds of large data bases or facilities that may be available at the national level. At this point they don't have the training to use them. They don't have the telecommunications systems in terms of the networking protocols that let you get into a sophisticated data base. And they don't have the equipment that would be required. You can't use your PC to display the graphic data that was shown earlier.

Could I have the next slide, please?

[Slide.]

Colonel ADAMS. I have listed here three issues. And actually, you have heard each one of these. These are not necessarily meant to be recommendations, but they are certainly things that would turn into some form of a recommendation.

The first issue that came up is the one about multijurisdiction. We saw places that were self-contained locally, but many of the disasters go across boundaries, whether it's across those in the city of New York, whether it's across county boundaries or across State boundaries.

As an example, the frequencies in New York City between the fire, police, and the medical services, they're on different frequencies, so it's difficult to have communication. So no one is really paying a lot of attention to this multijurisdictional problem, as we could see it.

A second one, and sort of related, is the whole problem of mitigation management: How can you avoid or plan for disasters rather than plan to cope with it once it has happened? And I think some of the things that we heard about yesterday that Mr. Brugioni talked about in terms of being able to look at the snow cover, for example, and from that forecast what might happen, or in the hurricane people knew about the speed of the winds and what could happen to Galveston, but apparently people were not properly forewarned and told to take specific action.

People may be told to prepare mitigation plans, but that's not adequate to tell local groups to go plan. Somebody really needs to sort of watch where the opportunities are for planning and to take action at some higher level and where you can look across jurisdictions and across perhaps geographical areas.

The final point, and perhaps one that we spent the most time talking about, is the availability and accessibility of information. The person who is faced with the disaster generally, or in many cases, especially in the smaller communities, doesn't know where to go to get some information. And even in the group that we had here for the last 2 days of our workshop, people that were really experts in their area, when they got together, they found out from talking to one another that there were computers, that there were data bases, that there were different services that they did not all know about but that they found out about from one another.

That, I think, is only the tip of the iceberg in terms of getting at the information. Perhaps having some sort of a clearinghouse, which has been suggested by one or two of the other speakers, is a good idea, if nothing more than to find out where do I go to get information. And one will probably have a spectrum of use. Some people who only need to call up on a telephone and perhaps have an expert at the other end, interact with an automated system if that's the case, to the other end where people can afford the training, the equipment and have enough need so that they can directly access some of these data bases themselves.

But first they have to know about it, and knowing where to go for information is really one of the key problems that I think many people in this area face.

Mr. GORE. Thank you very much.

Mr. Hicken, do you want to add some thoughts to that? Let me welcome you back to the subcommittee. We appreciated your appearance here in the 1981 hearings on this subject, and we appreciate your continued contribution. And do you care to add some thoughts?

Mr. HICKEN. I think the one thing that I would like to add is that in the two programs that we did have in our group, is the fact that it was highly people-oriented. It was individuals at the local level doing things and making use of very scarce resources, being very innovative to get things done at that level. And yet, as Duane pointed out, we heard of other counties and other cities which had the same charters and had nothing going. So it's a highly people-oriented thing.

The only other comment which I would like to make is that not only on the availability of information as sort of a central clearinghouse, of letting people know what's available, but how to use it

and how to get at it and how to access it. It isn't very useful to tell them that there is a data base available, if he still doesn't know how to retrieve it, or how to use a data base once he knows it's even available. I think that's an important item.

That's all I have.

Mr. GORE. Well, very good. Thank you both. And thanks to every member of your group. We appreciate it very much. And we will take your recommendations very carefully into account. Thank you.

Colonel ADAMS. Thank you.

Mr. GORE. The final group, group VI, dealt with public policy issues. And I would like to invite the group leader, Dr. Joseph F. Coates, from Washington, D.C., to the witness table; and Roy Popkin, deputy director for disaster services at the national headquarters of the Red Cross of America. I would like to welcome you both.

And, Dr. Coates, without objection, we will put the names of everyone who served in your group in the record at this point. And I would like to invite you to proceed with your presentation.

[The material referred to follows:]

Group VI - Public policy issues

Group Leader: Joseph F. Coates
President
J.F. Coates, Inc.

Rapporteur: Mr. Roy S. Fopkin
Deputy Director
Disaster Services
American Red Cross

Participants

Mr. Arthur Cooke
Federal Emergency M[illegible]

Hon. John B. Farmakis
Chief Administrati[illegible]
U.S. Dept. of Ener[illegible]

Mr. Richard R. [illegible]
Senior Director
Strategic Studie[illegible]
SRI Internati[illegible]

Mr. Edward [illegible]
Chief of [illegible]
Integrated
National [illegible]

Mr. [illegible]
Ass[illegible]
I[illegible]

Mr. [illegible]
Chief
Office
Telecom[illegible]
Veterans [illegible]

Mr. [illegible]
Water Resources
Corps of Engineers

Mr. Donald E. Kraft
National Communications System

Dr. Louis Krauthoff
Washington, D.C.

Dr. Irwin L. [illegible]
Vice President
American [illegible]

Ms. Myra Lee
Directors Office of Emergency Management
Portland, Oregon

Mrs. Nancy Miller
Analyst, SPRD
CRS
The Library of Congress

Mr. Charles Carter Noble
Deputy Associate Director for Telecommunications
Veterans Administration

Millard Roderick, Ph.D.
Senior Research Fellow
International Institute on Environmental Health Risks
Washington, D.C.

Mr. Harold Silverstein
SRI International - Washington, D.C.

Mr. Bernard Stewart
SRI International - Washington, D.C.

STATEMENT OF DR. JOSEPH F. COATES, J. F. COATES, INC., WASHINGTON, D.C., ACCOMPANIED BY ROY POPKIN, DEPUTY DIRECTOR, DISASTER SERVICES, NATIONAL HEADQUARTERS, RED CROSS OF AMERICA, WASHINGTON, D.C.

Dr. COATES. Thank you. It's a pleasure to be here. Twenty-one of us met yesterday and today to discuss the public policy issues. We generated a list of some 20 issues, did a bit of scoring and evaluation, and ended up discussing some top seven of them. I won't review all of them, but only hit on the high points of our discussion. The rest is available for the record.

The perhaps most significant and striking point of consensus was that divestiture, the AT&T divestiture, is bad news. The divestiture of AT&T is bad news. Before divestiture, you had perhaps the largest, most complex, and best functioning technological system in the world, with a high stake in maintenance, reliability, service, continuity, and so on. With the divestiture and the breakup, a new economic set of incentives come into play which can have very adverse effects on emergency information management.

For example, suppose a disaster occurs and a telephone network system gets wiped out in a city in California. Under the old system, the telephone company had a strong incentive to fly in emergency equipment, bring in people and personnel, expend large quantities of money to get that service back in shape quickly, knowing that it had opportunities to recover costs. Well, there are just no longer those incentives. The new incentives seem to be to cut corners, cut costs, buy foreign equipment, buy lowest-cost equipment, and so on.

So that's one point on which I think there was substantial consensus.

Related to that, the divestiture does not seem to have in any way attended to emergency questions. The people principally responsible for divestiture—a Federal judge, the Justice Department—probably could not have cared less about the technological side of the system. And there is no evidence that they cared for the emergency services side of it.

The telephone company itself made no particular issue of it. And FCC was a minor actor.

So consequently, the group more or less concluded that much of the security, maintenance, emergency elements in the Communication Act of 1934 are de facto skirted and neutralized by the divestiture. The group concluded that the Congress should give very close attention to reviewing the Communications Act of 1934 not only in other terms that may be of concern to the Congress but specifically in emergency terms.

Going along with divestiture, universal service, and coactivity—to use some jargon terms—seem to be going by the board. The purchase of foreign equipment, the breakup, the maintenance, procurement, and all [illegible] that the robustness of the telecommunications system. All that in the short run that probably won't mean much, but in the long run it probably implies a steady and continuous deterioration in the quality and performance in the face of emergency.

Another point we moved on to, an incidental but rather interesting one, is we could find no strong evidence that cost-benefit analy-

ses played any significant part in the policy formulation within FEMA. While we did learn that cost-benefit is used, it's not clear that it was a key factor in any decisions made.

The third point is on the question of decisionmakers and the delivery of information to decisionmakers. The central conclusion was that it's an extremely complex area; it's not at all clear who the decisionmakers and users of information are. It is clear that they're in a hierarchy; they're in a nested relationship; their relationships are complex; and no one seems to understand what the full system of information is that they need.

The consequence is that there is frequently overload, underload, and misinformation—that is, irrelevant information—delivered to any particular point in the system.

So there was a strong feeling that close oversight attention should be given to that question. In particular, the agencies might begin to look at the question of a closer look at their own clientele and to exercise the system to determine what its needs were.

It was unclear—as another point—it was unclear from the discussions to what extent the performance and good performance of FEMA is misunderstood, inaccurately presented, and misrepresented. The sense was that the group broke in two, as to whether FEMA was with it, moving ahead, and being aggressive in dealing with communications questions or whether in fact they were somewhat behind the learning curve.

Another point coming out of the discussion is that in days gone by we had an Office of Telecommunications Policy with a strong incentive, statutory obligation, to act as the central policy clearinghouse. The group felt that some oversight attention should be given to the question of whether there is a need to reformulate some group with the equivalent function to the Office of Telecommunications Policy.

Policy on communications and therefore policy vis-a-vis emergencies is in bad shape.

Another question that came up as a focus of the group's policy attention framed itself around the mingling, comingling, organizational mixing of civil and military emergency questions. The group, frankly, was split on this question. There were good arguments for mixing and for keeping them separate, and it certainly seemed to be the case that the Congress should be giving much closer attention to the civil sector needs and to the extent to which they are different from, incompatible with, and driven in not healthy directions by the strong emphasis on military national security questions.

The general question of universal service I have already touched on.

On the question of technology transfer and the adoption of new technology by State and local, and other level users, there was a strong feeling that there was not an adequate place to turn to get judgment or evaluation, all those things that a good consumer would want about the purchase of new technology and its use.

Another point that came out of the discussion had to do with, related to that, how to make information products more useful to decisionmakers. In general the question that we felt some Federal agency should be moving to answer is to identify the topics of infor-

mation necessary for decisionmakers, identify the type of information necessary at each level of decisionmakers, and identify who will distribute information at each level.

As one of our participants put it, we need a clear understanding of the types of products needed by both the decisionmakers and the eventual consumers of the product, the people. The group's feeling was that we are a country mile from achieving that very practical, down-to-earth, and gutsy objective.

The group also addressed the question of what steps should be taken to enhance civil and defense sharing and exchange of key, knowledge and resources. At least one person in the group suggested the establishment of a national level task force to examine the opportunities for sharing key civil and defense knowledge and resources.

I believe that is subsidiary to the larger question which merits close examination, of the mix of attention to civil and noncivil emergencies.

I believe those are the central points that we covered. Roy, is there anything you want to add?

Mr. POPKIN. I would like to just add one thing, Mr. Chairman. It is an act of politeness to say that I am pleased to be here. But I want to go beyond that and say why I am pleased to be here.

In the last 3 years, I have been involved in two comparable reviews of needs, one an assessment of the 5-year earthquake hazard reduction plan, and another the preparation of a report on flood hazards mitigation.

Both of those groups met and did their reports at the request of the Congress, and in both instances the reports got short stopped over at OMB. I do not think one of them has gotten to the Congress yet.

Here we—all of us here—have had an opportunity to speak directly to you and we appreciate that.

Mr. GORE. Well, thank you very much. We have had occasion in the past to comment on the apparent black hole at OMB that swallows things up. [Laughter.]

And the weight of their own procedures seems to prevent the reemergence of some excellent work from time to time.

But I want to thank both of you for your fine work on this group, and each member of your group.

I want to thank all of the 100 plus distinguished experts from around the country who have contributed to this unusual approach to a 2-day congressional hearing. I am more convinced than ever that this format is a useful and successful one, to let experts meet with each other and then present consensus recommendations about a variety of related topics to a congressional subcommittee. I have found it extremely enlightening, and we are going to review this record extensively and will be in further consultation with members of this group that have assembled from around the country in preparing our report and our recommendations.

I would like to acknowledge the special contribution and hard work of Bob Chartrand who has done more than anyone else to pull together this group and make this hearing possible.

I would like to recognize Bob for any closing comments that you might have. Do you want to take the witness table? That would be fine.

As most of you, I believe, know, Bob has a considerable amount of expertise in this area and has been responsible for much of my interest in this area.

STATEMENT OF ROBERT L. CHARTRAND, SENIOR SPECIALIST IN INFORMATION POLICY AND TECHNOLOGY, CONGRESSIONAL RESEARCH SERVICE

Mr. CHARTRAND. Thank you, Mr. Chairman.

There is a rising cadence of concern—as enunciated by Chairman Gore and reflected in many of the findings of this workshop—that we as a Nation have not been sufficiently resolute in preparing ourselves for adverse happenings nor fully convinced that foresight in dealing with major emergencies is a worthwhile investment.

In convening this hearing and related workshop on information technology and emergency management, Representative Gore posed a series of critical questions regarding our ability, at home or abroad, to handle disasters effectively, and these included: One, were the existing warning systems adequate?; two, should we have been able to predict such emergencies?; three, once alerted, did we react as quickly as we should have?; and four, is the current technology sufficient and, if not, what do we need for the future?

The thrust of these sessions and those which laid the groundwork in 1981 has been to focus the attention of public sector authorities and private sector support groups on what Dr. William O. Baker termed a requirement, "to enhance a Federal readiness for service to our people in emergency needs."

Responsible organizations and individuals at all levels of government as well as in the private domain are becoming increasingly committed to the belief that there is room within the emergency management milieu both for carefully structured traditional processes and technology-supported systems. This meld of the old and new offers decisionnakers an integrated, reliable framework for their roles along with an expanded capacity for obtaining requisite information and exercising their initiatives through the use of improvisational intelligence.

The experiences and insight of the senior resource people who comprise this workshop—the planners, the technological innovators, the catalysts, the program managers, teachers, and information "gatekeepers"—have been drawn upon in order to render selected recommendations and conclusions that will allow this subcommittee to fulfill its responsibilities. These collective findings include certain key issues related to the present and potential utilization of various information technologies and priority candidate initiatives which Congress, Federal departments and agencies, State and local governments, and a range of private organizations may consider.

Illustrative of these priority action areas are three:

One, increased sharing of information acquisition, interpretation, and processing capabilities—including the use of advanced sensor-

oriented systems—by both defense/intelligence and civil sector agencies.

Two, creation of an officially authorized task force responsible for the sustained monitoring of potential crisis areas—both natural and technological—and helping plan anticipatory actions to mitigate or prevent such emergencies.

Three, reexamination of the emergency management and operational preparedness needs and capabilities.

It should be understood that these hearings and the congressional workshop represent, as Chairman Gore asserted, a first phase of legislative involvement. The best human and technological resources that this Nation has to offer must be marshalled for greatest effect. At another critical juncture in our history, President Franklin Delano Roosevelt perceived a similar need and declared that: "New frontiers of the mind are before us, and if they are pinoneered with the same vision, boldness, and drive with which we waged war, we can create a fuller and more fruitful life."

And finally, although some have said that we live in an age when people have become less expectant of good, there are still those, as represented here, who are dedicated to ensuring the public welfare through better emergency preparedness and response.

At this time I do not think it would be amiss if I expressed on behalf of this entire group our appreciation to Chairman Gore for his leadership and his genuine belief in the importance of this crucial area.

Thank you.

Mr. GORE. Well, thank you, and thanks to every single participant in this 2-day hearing and set of workshops. We appreciate the time, and energy, and thought put into this exercise, and I trust that it has been valuable for you. I assure you, it has been for the subcommittee.

We will continue our active interest in this area with a set of recommendations which will then form the blueprint for a set of actions in the coming months to try to implement some of your ideas and recommendations.

With that, let me thank you again and declare this hearing adjourned.

[Whereupon, at 3:20 p.m., the subcommittee adjourned, to reconvene subject to the call of the Chair.]

APPENDIX

CHANGES IN ORAL TESTIMONY SUBMITTED BY MR. DINO BRUGIONI

2101 Reynolds Street
Falls Church, VA 22043
December 12, 1983

Honorable Albert Gore, Jr., Chairman
Subcommittee on Investigations and
Oversight
Committee on Science and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

I would like to request that the following changes be made in my testimony before the Subcommittee on November 16, 1983:

1. Page 62, lines 1433 and 1439: Change "1941" to "1942".

2. Page 109, line 2589: After "Beale", add, "Headquarters, 9th Strategic Reconnaissance Wing (SAC), Beale Air Force Base, California".

3. Page 110, line 2609: After "California", add, "Blythe is in California near the Colorado River which forms the border with California and Arizona. It is up river from Yuma."

4. Page 111, line 3643: Change "the governor" to "an aide to the governor".

5. Page 117, line 2800: After "aircraft", add, "[showing page 8 'U-2 Sensor Complement' photo of NASA publication, 'High Altitude Perspective']".

Thank you for your courtesy in this matter.

Sincerely,

Dino G. Brugioni

Dino Brugioni

DB/k